Southern Power & Industry

The Industrial and Power Journal of [illegible] and Southwest

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4

MAY, 1961

Maintenance

See Contents — P. 3

MAINTENANCE planners place a lot of emphasis on safety. This Republic Steel Corporation employee is keying a thermocouple into a gas line at the Gadsden, Alabama plant. He is protected by breathing apparatus, sound-powered telephone, and life line. — See P. 52.

NOW POSITIVE CORROSION PROTECTION FOR THE INTERIOR OF BRICK, STEEL AND CONCRETE CHIMNEYS

Only material proved effective against acids formed by Sulfur Dioxide and Sulfur Trioxide.

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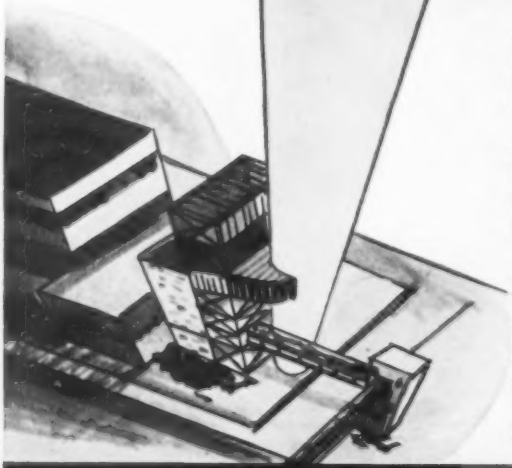

In recent years the cost of new chimney construction and maintenance has skyrocketed due to greater use of more economical low cost coal, heavy fuel oil, refinery sludge and sour gases which form stronger acids resulting from the use of these high sulfur fuels. The lowering of the gas temperatures through the use of economizers has increased the problem. Heretofore no coating has succeeded in resisting these highly corrosive acid gases.

Now, after two years of intensive research and testing, Benjamin Foster Company releases STACKFAS—the world's first exclusive corrosion resistant material proved effective against high sulfur chimney gases.

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For complete details, specifications and applications of Foster STACKFAS, write for Bulletin No. SF-61.

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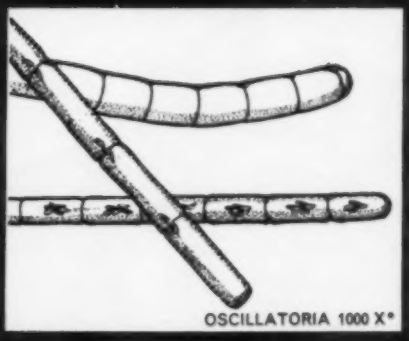
Here's what grows in your cooling towers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SCENEDESMUS 1000 X*

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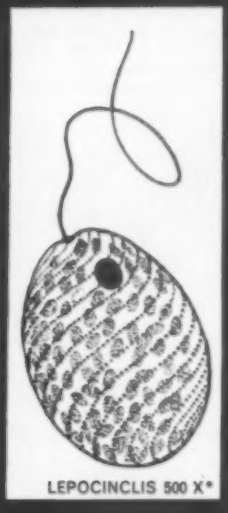
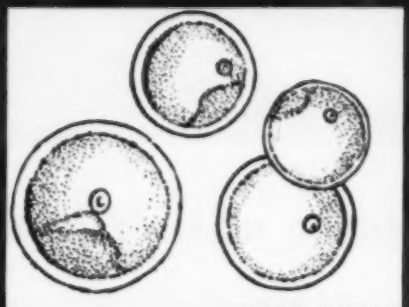

LEPOCINCLIS 500 X*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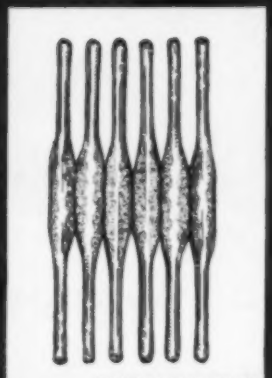
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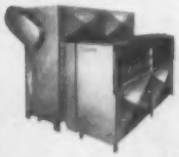
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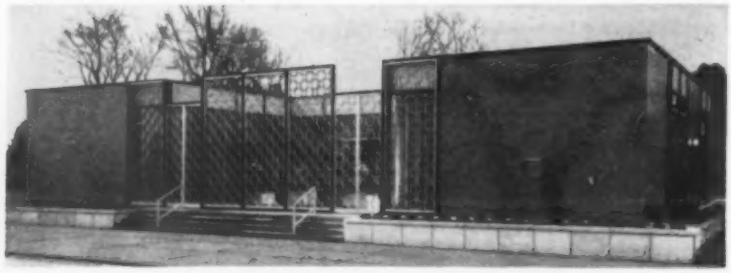

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Southern Power & Industry

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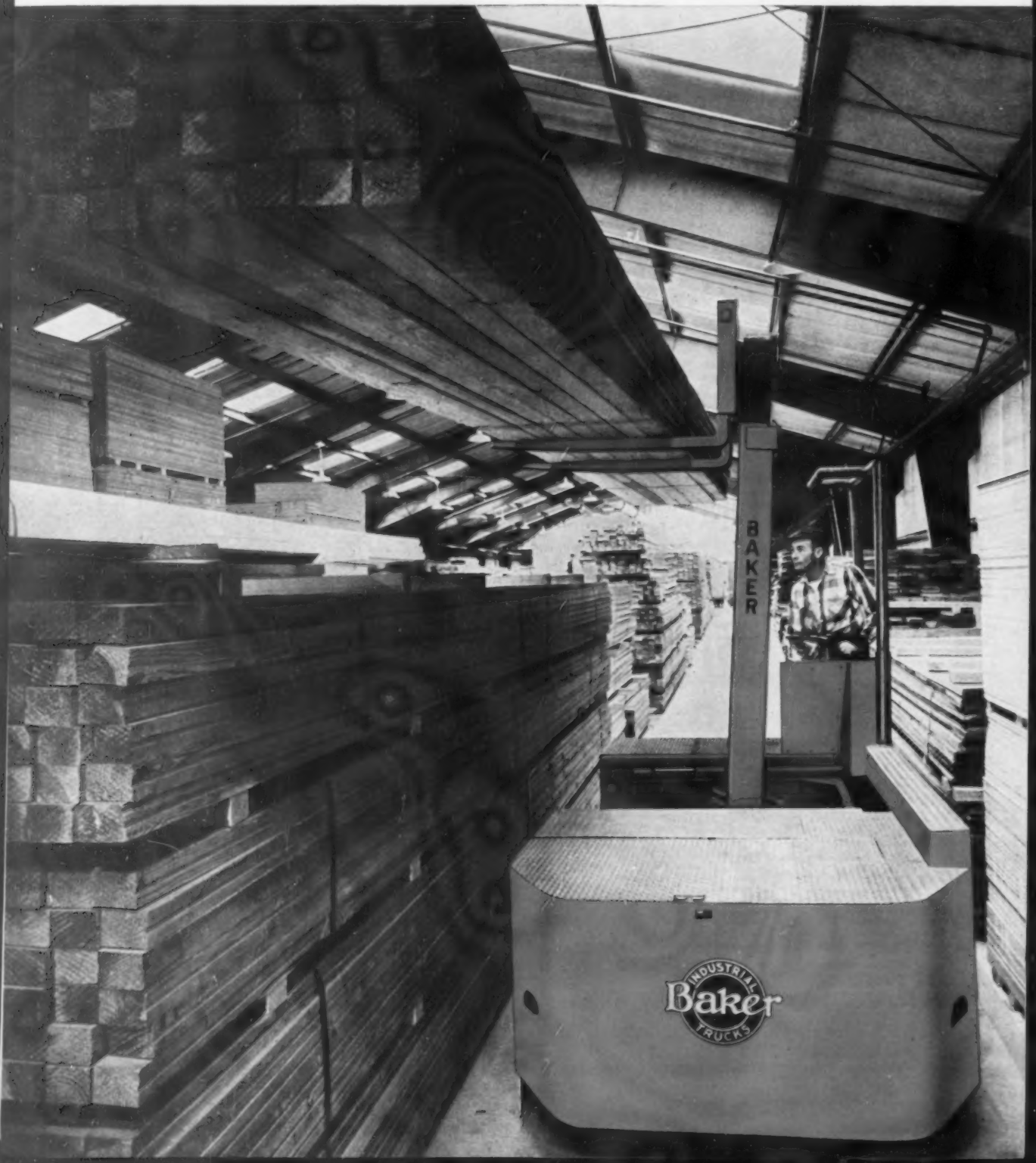
BAKER TRAVELOADER® cuts warehouse operating costs

The custom-made doors produced by Richards-Wilcox Manufacturing Company require materials in awkard lengths and sizes. The side-loading Baker Traveloader easily handles long, bulky selective loads...maneuvers in aisles only 6½′ wide. Note how it stacks right up to the 14′ ceiling. Model shown is TPD-040, electric-powered. Also available in gas Ready-Power.



by over $10,000

Richards-Wilcox Manufacturing Company, Aurora, Illinois, manufacturers of overhead chain conveyors, industrial doors and door operators, moveable walls . . . REPORTS . . .

"We need to operate our Baker electric Traveloader only about 700 hours a year—less than 3 hours a day. Yet, it does the work of 2 full-time men. What we save on labor costs alone will pay for our Traveloader in less than 2 years. We figure it saves us at least $10,000 a year."

The exclusive side-loading feature of the Baker Traveloader enables Richards-Wilcox to pick up long, bulky loads at the railroad spur and move them quickly and efficiently into their warehouse. One unit loads, stacks, transports . . . requiring only one man, instead of a crew. The versatile Traveloader moves both 12′ to 30′ lengths of lumber and 4′ x 8′ plywood panels. Loads average from 3,000 to 4,000 lbs.

Working on an average of only 2¼ hours a day, the Traveloader saves Richards-Wilcox 3,300 man-hours annually—the equivalent of two full-time men.

Operates in 6½′ aisles

Because it operates in an aisle only 6½′ wide . . . stacks up to 14 feet . . . the Traveloader enables Richards-Wilcox to make maximum use of their warehouse space.

In fact, they can handle 500,000 board feet of lumber and 225,000 board feet of plywood and hardboard in only 13,000 square feet of space.

Only 5 lubrication points

Maintenance on the Traveloader is nominal. Five lubrication points are periodically checked. A twice-weekly, overnight battery charge keeps the truck operating at peak efficiency.

Richards-Wilcox find their Traveloader both cleaner and much more economical to operate than their smaller-capacity, gasoline-powered trucks. Put into operation in February 1960, a single Traveloader saved this company over $10,000 the first year.

Your BAKER BRANCH or FRANCHISED DEALER is listed in the YELLOW PAGES under "TRUCKS—INDUSTRIAL"

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Facts and Trends

May, 1961

◆ DOWNWARD TREND HALTED—Chance Vought Corporation, Dallas, Texas, entered new fields of endeavor in 1961. In less than two years the company has reshaped its corporate structure to develop new military and space age markets and to diversify into industrial and consumer goods fields.

These new activities in 1960 enabled the company to offset a portion of the sizable decline in sales resulting from a reduction in scheduled shipments of Navy aircraft. The downward trend in sales and earnings has been halted, according to President F. O. Detweiler.

◆ INDUSTRIAL STANDARDIZATION will be the topic of a five-day seminar to be conducted June 19 through 23 by Dr. John Gaillard, consultant on industrial standardization, in the Engineering Societies Building in New York City.

The 30th such seminar of its kind, the five-day meeting is designed to assist companies in the organization of their standardization work and training of staff members. To date, 436 representatives of 244 industrial concerns and governmental agencies have attended the seminars. For more information, write Dr. John Gaillard, 135 Old Palisade Road, Fort Lee, N. J.

◆ FILLING THE JOB GAP—Last year alone, Fort Smith, Arkansas, added 1,188 new jobs. That erased the 1,053 jobs lost when Fort Chaffee went silent. Seven brand new industries and 22 industrial expansions in 1960 meant a total expenditure of $18,047,000.

Nearing completion is the Norge unit of Borg-Warner. This is a $10 million, 25-acre plant on a 104-acre site—largest single industrial start last year in the nation by private industry. Production started last month in the new $3 million Ohio Rubber Company plant. Dixie Cup Company is undergoing its third expansion, which will increase its employment to around 1,200.

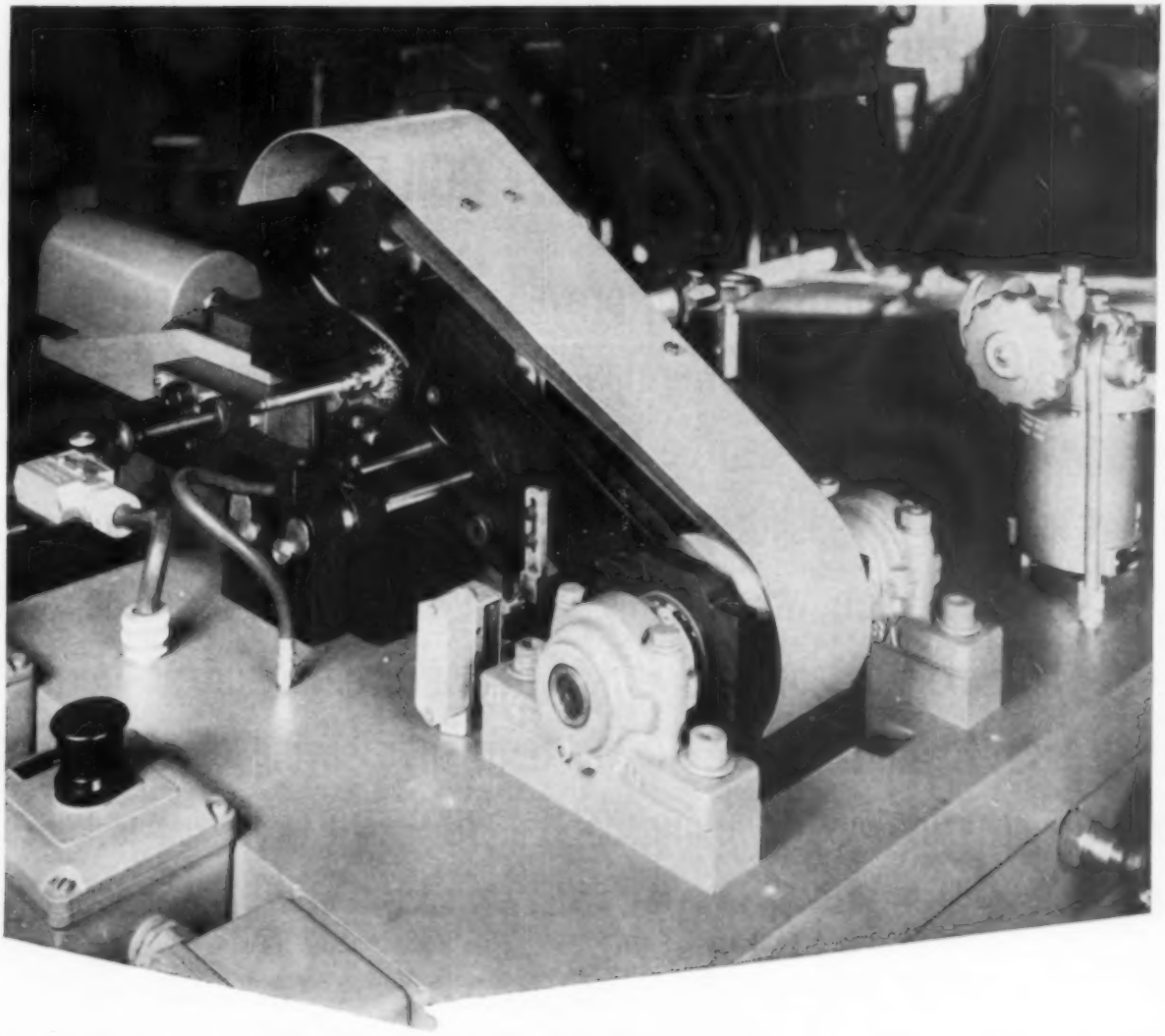
◆ NUCLEAR POWER—Large-scale boiling water nuclear power plants can now be built to compete with fossil-fueled power stations in some areas of the country.

Dr. R. B. Richards, a General Electric spokesman, told the American Power Conference that a standard 500,000-kilowatt dual-cycle boiling water reactor plant can be built using today's technology for startup in 1965 at a cost of $175 per kw under favorable conditions. This huge atom plant would initially produce power at 6.56 mills per kwh, reducing to 6 mills with the third and future core loadings.

◆ RESIST PRODUCTS—Photographic techniques that may make it possible to construct an entire electronic amplifier in a space smaller than a period were discussed at Eastman Kodak Company's first symposium on printed circuits and miniaturization.

Main topics of the meeting were the use of photography and of Kodak Photo Resist products. "Resist" products are special

(Continued on page 9)



New machine suffered from short bearing life until Dixie Bearings helped in re-design

The problem was high speed and a shock load condition. Together they spelled trouble for this new commutator turning machine that produces 500 to 700 finished commutators per hour. Our customer asked us to help eliminate the problem of short bearing life due to the impact and speed of the operation.

We helped re-design the machine to use oil mist lubricated pillow blocks on the drive end as well as a bearing with higher load carrying capacities in the driving arm. Since these changes, our customer has had no further trouble with the bearings.

If *you* have a problem regarding bearings, give our nearest branch a call. You'll get the help you want!

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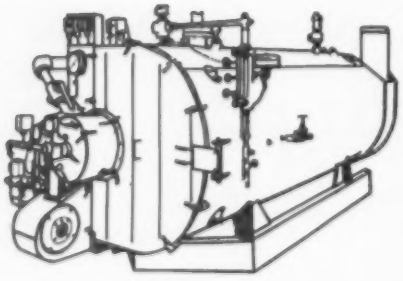
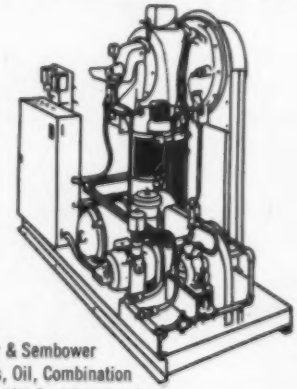


Powermaster Positive Flow Packaged Automatic Steam and Hot Water Boilers



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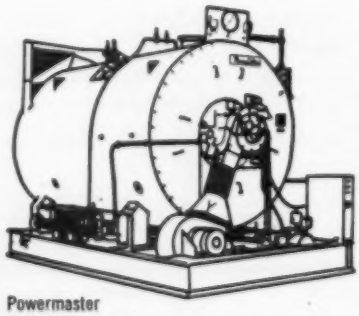

Powermaster Model 3 Packaged Automatic Steam and Hot Water Boilers

Facts and Trends (Continued)

compounds that harden under the action of light and development. The hardened resist protects metal during chemical etching to form items such as printed circuits. Where the coated metal is not struck by light during exposure through a negative, the coating is washed off and the bare metal is attacked by the etching acid.

◆ GAS TURBINES may double in size and bring further dramatic power generation cost reductions before the end of this decade, General Electric engineers predict. Depending on local conditions, gas turbine peak load generating units may now be installed for $75 to $100 per kw.

The engineers cited figures showing that 57 General Electric gas turbines in base load operation recorded an average reliability of 99.5 per cent and availability of 98 per cent. They forecast that base load use of gas turbines in combined gas-steam turbine cycle will contribute to reduction in fuel cost. General availability of coal burning gas turbine systems will not occur for several years, so use will be limited to gas or oil burning areas until then.

◆ MORE RED TAPE?—Speaking for its thousands of small businessmen members, the Chamber of Commerce asked Congress not to tangle further the small businessman's problems on getting Defense Department contracts by giving some contracting authority (but not responsibility) to the Small Business Administration.

Small businessmen are hindered now by Defense Department red tape, the National Chamber said. It urged that Congress refrain from adding more red tape and confusion by making them go through two government agencies. Most have neither the time nor the staff for this, and many would give up government business, the Chamber said.

◆ ELECTRONIC TRACER—A new economical electronic tracer—well suited for cutting work of a non-repetitive type or where a minimum investment in templates is necessary—is being marketed by Air Reduction Sales Company. The unit uses templates prepared by conventional drafting methods.

The tracer uses a small light-sensitive element located in the scanning head to follow the template line of the part to be cut. The tracer head is mounted on the operating bar of the cutting machine and automatically provides the desired motion of the torches during the cutting operation.

◆ UTILITIES AND ATOMICS—One hundred twenty-nine electric utility companies are participating either singly or in groups in 25 separate nuclear power projects aimed at attaining economically competitive nuclear power. The projects range from research groups to operation of existing plants. The electric utility companies' nuclear power development efforts involve utility expenditures of about 700 million dollars.

These and other facts about the electric companies' nuclear activities were disclosed before the Joint Congressional Committee on Atomic Energy by William J. Clapp, Chairman of the Edison Electric Institute Committee on Atomic Power, and President of Florida Power Corp.

◆ CUT DISTRIBUTION COST—Speaking at the recent American Management Association seminar, Philip F. Cannon, Vice-President of Barrington and Company, said: "On the one hand, managements are deeply concerned because high distribution costs eat up

(Continued on page 14)

"When we put in the Payroll Savings Plan...

"It fitted into our operation perfectly...

"I had an idea it might be a bit complicated to install the Payroll Savings Plan. Seeing all our people, explaining how it operates, pointing out its advantages. But the way it worked out it was simplicity itself.

"All we did was contact our State Savings Bonds Director. He outlined the campaign for us, working through the bond officer we appointed. A short, company-wide person-to-person canvass was set up—and the results were absolutely amazing. Some of our people told us later that since they found out how convenient it is to save *regularly* through the Payroll plan they have actually increased other investments, too!"

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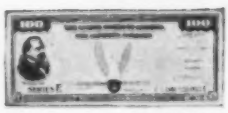
For prompt, friendly help in setting up a Payroll Savings Plan in your organization, contact your State Savings Bonds Director. Or write Savings Bonds Division, U.S. Treasury Department, Washington, D.C.

ALL U.S. SAVINGS BONDS—OLD OR NEW—EARN ½% MORE THAN BEFORE



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2. One-company responsibility. Shop-fabrication by Grinnell makes one experienced organization responsible for material procurement, engineering, fabrication and delivery. These many interrelated factors are kept in balance to give you quality at an economy price — no runaway costs.

3. Costs known in advance. With Grinnell, you know all costs — including shop sketches and planning, materials, power services, expendable tools and supplies — *before* you start the job.

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NOPCO CHEMICAL COMPANY
Harrison, New Jersey
Chemicals • Plastics • Vitamin Products

Is elevator maintenance complex? Yes! As the illustrations indicate. It is an organization task requiring an unusual combination of skills. Plus a wide knowledge of parts, assemblies, functions, replacement procedures, testing and adjusting. Plus the availability of original replacement parts. Plus immediate service in emergencies.

Is OTIS elevator maintenance dependable? NOPCO has been using it since December 15, 1930 to keep seven Otis Freight Elevators and one Passenger Elevator providing vital production capacity.

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OFFICES IN 297 CITIES ACROSS THE UNITED STATES AND CANADA

capacity with Otis Elevator Maintenance

Checking the floor selector that controls an elevator's operation and making any adjustments or replacements needed for top performance.

In the hoistway, on top of the car, the maintenance expert inspects the operating mechanisms and other parts vital to performance and safety.

Under the elevator, checking the action as well as condition of safeties and, as shown here, roller guides that make for smooth riding.

Moving parts requiring lubrication are oiled or greased at regular intervals with lubricants especially selected for prevailing service conditions.

Under the car platform, maintenance man inspects load-weighing switches. These switches weigh the passenger load in the car.

Lubricating an overspeed governor. All elevator safety equipment, though never used, must always be in condition to act without fail.

ENGINEERED

freight Otis **elevators**

MAINTENANCE

Facts and Trends (Continued)

profits. But, in most companies, distribution problems still have not received the top-level consideration they deserve."

The consultant's solution: Establish the new post of Distribution Manager and rank it on a par with the top jobs. Let the new man be responsible for everything between production and actual selling, order processing, inventory control, warehousing, shipping, traffic, and transportation.

◆ HOUSING TREND—The 60's will see a shift toward apartments and row houses, according to a recent Business Conditions bulletin of the Alexander Hamilton Institute. By 1970 the population will hit 213 million, but the growth will not be spread evenly over the various age groups.

Next to children, the largest population increases will be in the age groups 20-24 and over 65. The younger people will need economical housing which can be disposed of easily as they move around the country in search of better jobs. The older folks, living on pensions, will need inexpensive housing, designed to give the compactness and convenience of apartment living.

Write the editors for additional information on any of the above items. SOUTHERN POWER & INDUSTRY, 1760 Peachtree Road, N. W., Atlanta 9, Ga.

. . . . . REPRINTS AVAILABLE . . . . . .

Write the editors of SPI for small quantities of the following at no charge

- SEGCO 1,000,000 KW PLANT—A 16-page folder describing this large new Alabama plant, serving Alabama Power Co. and Georgia Power Co., is a combination of two technical articles from SPI's September and November issues.
- HOW EPOXY CAN SERVE YOU—4 pages. Tells exactly how 10 separate repair jobs were handled and describes several epoxy mixes that are good for maintenance jobs.
- ORIFICE METER INSTALLATIONS—Tells what the plant man needs to know about installation to get accurate, dependable service.
- INSPECTION REPORTS—Tells how the station chemist can maintain information on the condition of boilers, cooling towers, condensers, heat exchangers, tanks and softeners. Actual inspection sheets are presented.
- ELECTRICAL DISTRIBUTION FOR LARGE PLANT—An 8-page special report prepared jointly by Director of Facilities, the Consultants, and the Contractor — describing plans and installation of all electrical services for new plant of Texas Instruments Inc., Dallas, Texas.
- THERMAL INSULATION DIRECTORY:
  Tells where to get service and technical data.....6 pages
- WATER TREATMENT DIRECTORY:
  Tells where to get service and technical data.....12 pages
- AIR & GAS CLEANING DIRECTORY:
  Tells where to get service and technical data.....16 pages
- COMBINED GAS-STEAM CYCLE PERFORMANCE:
  First year report on new plant, West Texas Utilities Co..6 pages

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Durability

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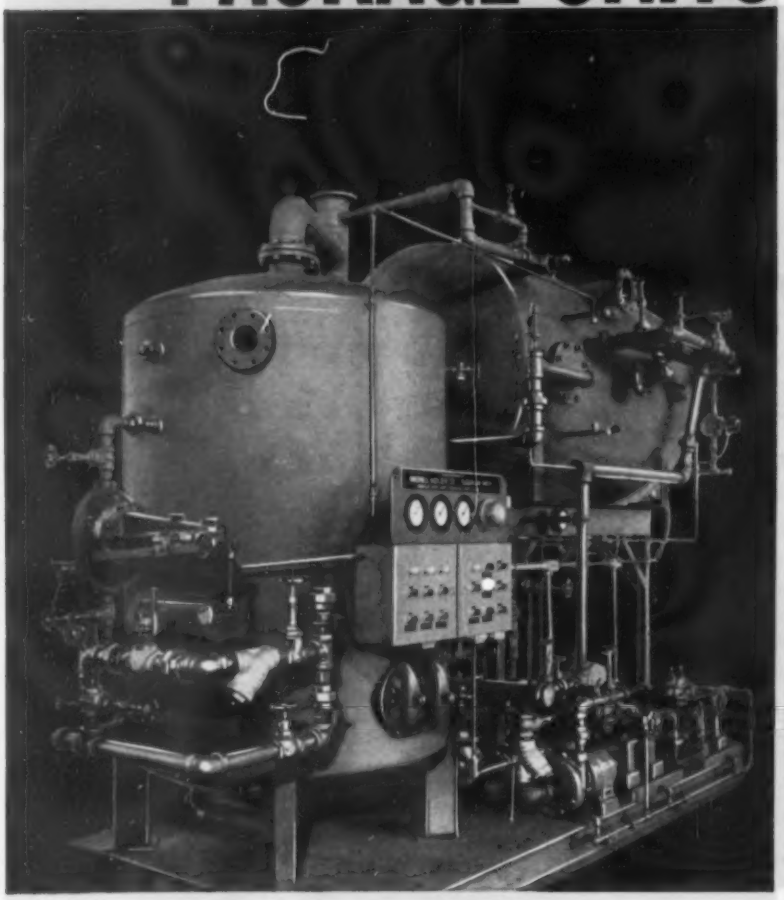
WICKES
BOILER AUXILIARY PACKAGE UNITS

standard



Save On First Cost • Engineering • Building Space • Construction Time • Operating and Maintenance Cost

Wickes Boiler Co. now offers a packaged system of various compact combinations of DEAERATING FEED WATER HEATERS, BOILER FEED PUMPS, CONDENSATE SURGE TANKS and BLOW-OFF TANKS. Standard units available for steam plants of 10,000 to 100,000 lbs. of steam per hour capacity and steam pressure to 300 PSIG. Information on special units of higher capacities and pressures upon request. Each unit is shop-assembled on a structural steel base, completely piped and wired and equipped with all necessary controls and an instrument panel.

173

Write today for Bulletin 59-1, which gives detailed engineering information on all three models of Wickes Boiler Auxiliary Package Units.

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the SOUTH—SOUTHWEST

more power . . . more plants . . . more money

Bestwall Gypsum Opens New Kansas Plant

The new multi-million dollar **Bestwall Gypsum Company** plant at Bestwall, near Blue Rapids, Kansas, is now in production. It has been under construction for more than a year. D. W. Peart is plant manager, and O. F. Grieve is manager of manufacturing.

The former Bestwall plant at Blue Rapids, in operation since 1896, was replaced to allow flowage for the Tuttle Creek Dam and Reservoir project. The new plant has a 40% increase in capacity, with additional facilities for the manufacture of gypsum board and lath. It will continue to produce industrial and wall plasters. Its employees presently number eighty-five.

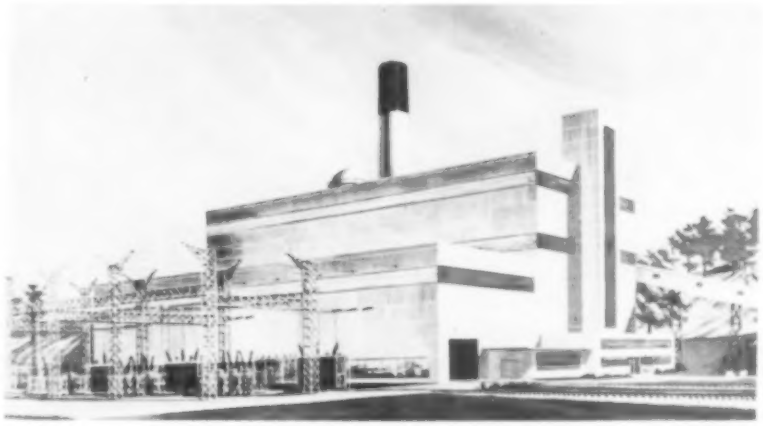
The Bestwall mine, oldest active gypsum mine west of the Mississippi, contains gypsum rock with a purity rating of upwards of 99%. The mine's purity rating allows Bestwall to produce a number of virtually exclusive gypsum products, including patented, high-strength Densite, used for molds and patterns for automobile, aircraft and missile manufacture.

The plant will have a complete laboratory in order to maintain the rigid specifications of expansion, setting time, fluidity and particle size involved in manufacture.

Lone Star Boat Co. Dedicates Texas Plant

Lone Star Boat Company, Plano, Texas, recently dedicated its new $2 million headquarters plant at a 40-acre site just north of Dallas. The ceremonies were timed to coincide with the 5th Annual Southwest Boat Show in Dallas.

Manufacturing operations, warehouse and offices cover over 340,000 square feet. The new plant features the latest design, production and shipping facilities in the boating industry and is said to be the largest plant of its kind in the world. D. O. Tomlin is president of the company.



Milledgeville-Eatonton Plant for Georgia Power

Plans by the **Georgia Power Company** to construct the first unit of what eventually will be one of the nation's most powerful generating plants were announced recently by John J. McDonough, company president. The site for the new giant steam-electric plant is on Lake Sinclair between Milledgeville and Eatonton in Putnam County.

Generating capacity of the initial $42-million unit is scheduled for 250,000 kilowatts. When the plant is completely developed, its generating capacity will be between 1½ million and 2 million kilowatts.

The company's largest installation is Plant Yates, near Newnan with 550,000 kilowatts in generating capacity. The Southern Electric Generating Company plant near Wilsonville, Ala., constructed and owned jointly by Georgia Power and Alabama Power Companies, will have a million-kilowatt capacity by 1962.

Following satisfactory reports on subsoil tests, preliminary design of the Milledgeville-Eatonton plant was begun. This design work is still under way. Most of the work during 1961 will consist of engineering studies, with the beginning of construction scheduled for 1962. Approximately $792,000 will be spent on the project this year. Target date for Unit No. 1 to go into actual operation is April, 1965.

The plant will be equipped to burn either coal or gas. When operating at full capacity, Unit No. 1 will require daily the contents of 23 railway coal cars, each of 100-ton capacity.

The new plant will be the third large power generating facility to be built by the Georgia Power Company in the Middle Georgia area. The first unit of Plant Arkwright, near Macon, was put into operation in 1941, with three units added later. Sinclair Dam, located only six miles from the site of the new plant, was completed in 1953.

Airco Opens New Gulf Coast Plant

Liquefied gas production began in March at **Air Reduction Sales Company's** new Tampa, Florida, plant.

Production has been under way at Airco's Baton Rouge, Louisiana, plant since last June. Each of the two Gulf Coast area plants, together with related distribution equipment, represents a multi-million dollar investment.

Liquefied industrial gases — oxygen, nitrogen, and argon — are being supplied by the plants to the growing industries in the areas. The major user of nitrogen from the Tampa plant is the citrus industry.

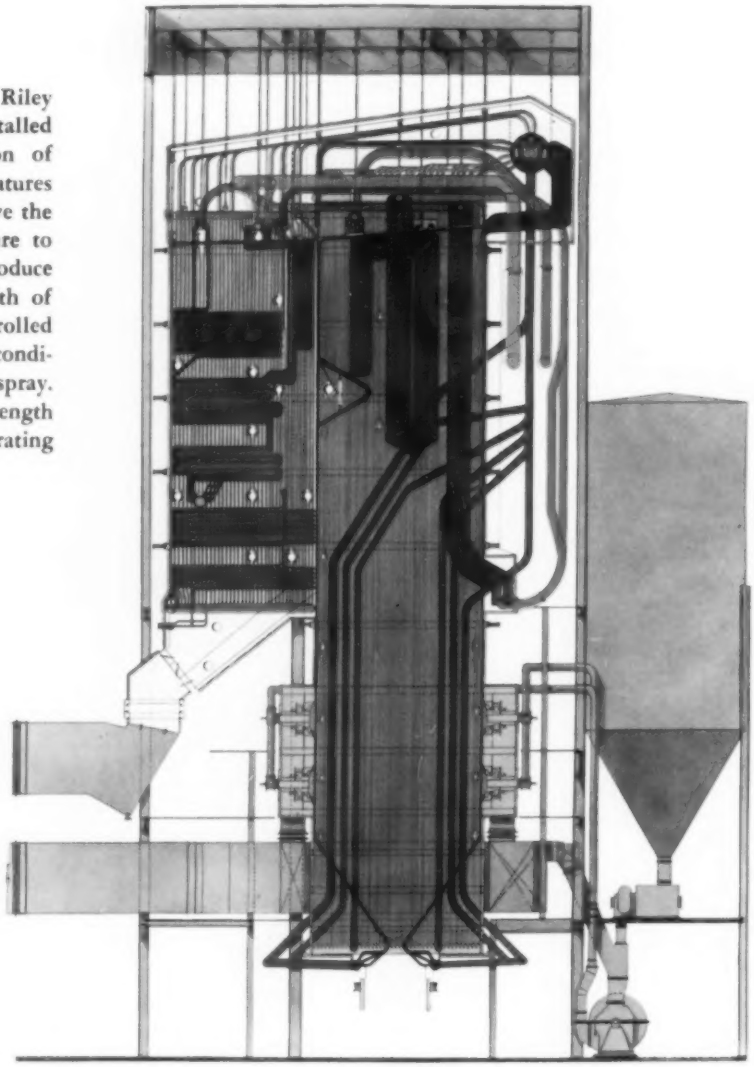
The Baton Rouge and Tampa plants are almost identical. Repre-

COMPLETE RILEY BOILER

for GOLDSBORO STEAM ELECTRIC STATION CAROLINA POWER & LIGHT COMPANY

The high pressure natural circulation Riley reheat steam generating unit soon to be installed at the Goldsboro Steam Electric Station of Carolina Power & Light Company features radiant superheater platens which will have the effect of reducing furnace gas temperature to correct levels at exit and also will produce uniform temperature across the full width of the furnace. Reheater temperature is controlled by dampers without spray under normal conditions. Steam temperature is controlled by spray. Large downcomers spaced equally across length of drum provide uniform feed to generating tubes.

EBASCO SERVICES, INC.
Consulting Engineers



RILEY COAL FIRED BOILER for

GOLDSBORO STEAM ELECTRIC PLANT
Unit No. 3
CAROLINA POWER & LIGHT COMPANY

- Capacity ..... 1,620,000 lbs/hr
- Operating Drum Pressure ..... 2640 psig
- Superheat/Reheat ..... 1005/1005 F.
- Fired by Coal
- 5-550 Riley Pulverizers
- 20 — Riley Burners Arranged for Opposed Firing in Single Furnace — 58 feet wide.

A careful survey of your plant by a qualified consulting engineer could show ways of making substantial savings in power costs.

RILEY

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RILEY STOKER CORPORATION, WORCESTER, MASSACHUSETTS

Sales Offices: Boston, Charlotte, Chicago, Cincinnati, Cleveland, Denver, Detroit, Honolulu, Houston, Jacksonville, Kansas City, Los Angeles, New Orleans, New York, Philadelphia, Pittsburgh, Portland, Salt Lake City, San Francisco, St. Louis, St. Paul, Seattle, Syracuse.

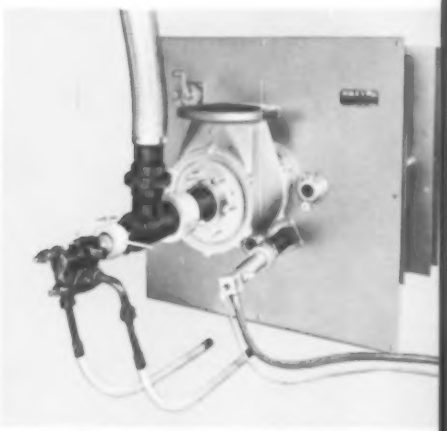
features

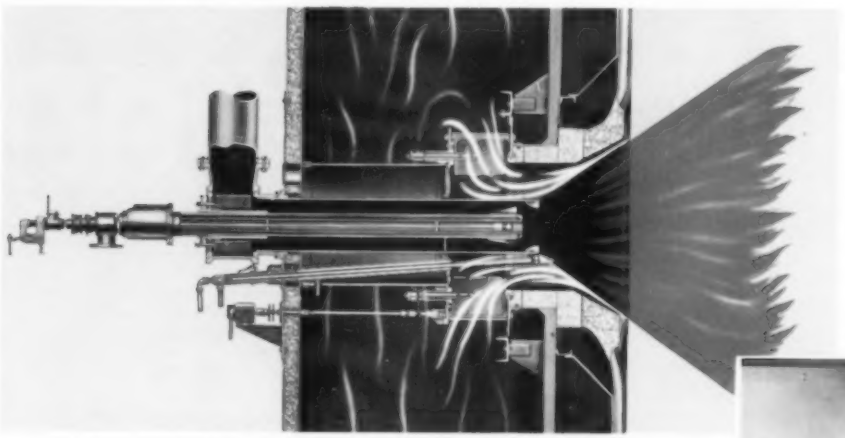
- 2640 P.S.I. OPERATING PRESSURE
- PLATEN TYPE RADIANT SUPERHEATER
- NEW TYPE 60 FLARE TYPE BURNER
- OPPOSED WALL FIRING
- NEW TYPE 60 DUPLEX PULVERIZERS

NEW RILEY BURNER HAS SIMPLIFIED FRONT PLATE — IDEAL FOR AUTOMATIC OPERATION

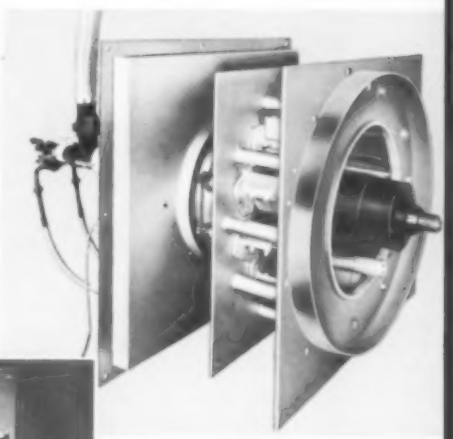
Some Operating Advantages:

- Mechanical moving parts move with boiler expansion—will not bind or jam.
- Vane control mechanism does not require lubrication.
- Automation with remote secondary air vane adjustment and indicators.
- Idle burners and ignitors well protected.
- Smooth, stable non pulsating flame thru load range.
- Non-plugging coal nozzle design.
- Turbulent mixing of primary air-coal secondary air.
- 180° rotation of vanes.



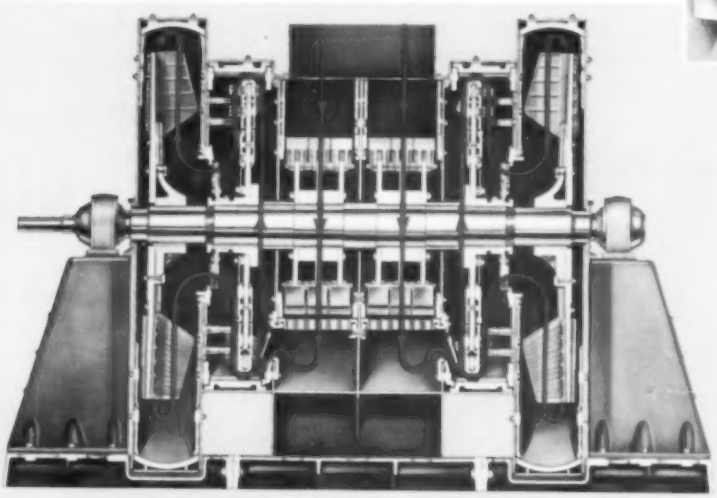


Arrangement for coal, oil, gas with pressurized boiler operation.



Above — Burner assembly for water-cooled burner throat.

Power unit for automated operation



NEW TYPE 60 DUPLEX PULVERIZER — has single coal entrance—two exits. New arrangement reduces number of feeders required. Simplifies automatic control of supply of coal and primary air.

Other features: minimum space requirements, quiet operation, sustained high fineness, tungsten carbide faced pulverizing elements, flash dries wet coal.

RILEY STOKER CORPORATION
WORCESTER, MASSACHUSETTS

You get excellent service and supply from

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One of the best ways to cut time and cost corners on building repair and other maintenance jobs is to have a reliable "one-stop" source for the many products needed. Eleven Reynolds Aluminum Supply Company warehouses provide this service. When spring "fix-it" time demands a keg of nails, a sheet of aluminum or galvanized roofing, a roll of insulation . . . or any of a hundred different repair products, your orders can be quickly filled and expedited through your RASCO branch.

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Each of Reynolds Aluminum Supply Company's eleven Building Repair Product Centers carries complete stocks of Aluminum Roofing and Siding, Gutters and Downspouts, Stylux Fiberglass Panels, Ventilators, Insulation, Flashing, Stainless Steel, Nails, Plywood, Insulation Board, Hardboard and many other materials needed in repair work.

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MEMPHIS, TENN. 703 North Royal Ave. JA 5-4717	**MIAMI, FLA.** 3690 N. W. 52nd St. NE 5-0647	**RALEIGH, N. C.** 1431 Courtland Dr. TE 4-6221	**RICHMOND, VA.** 1910 Petersburg Pike BE 3-9693	**SAVANNAH, GA.** 309 Stiles Ave. AD 6-2461	**NASHVILLE, TENN.** 700 Harrison Street AL 5-1152

senting a new type of partly outdoor construction, with only the control board, expansion motor and cylinder filling operation under a roof, both draw air into the plant at the rate of 131,000 cubic feet per hour and refrigerate it in a five-story high separation column. The finished products are drawn off in the form of intensely cold liquids. Peak production capacity is 30 tons of liquefied gas a day for each plant. The major advantage of oxygen, nitrogen and argon in liquid form over their gaseous form is that greater quantities can be stored in less space.

Rust Awarded Contract For Crossett Plant—Ark.

A multi-million dollar power plant, which will double the Crossett Company's capacity to generate electrical power, will be located at Crossett, Arkansas and utilized by Crossett Paper Mill in the production of pulp and paper.

Included in the installation will be a 20,000 killowatt steam turbine generator, a bark-and-gas-fired boiler with an hourly capacity of 300,000 pounds of steam, systems for conveying waste fuel from other manufacturing divisions to the boiler and lines to return power and steam to them. Total capacity will be raised to about 1,000,000 pounds of steam per hour and 36,000 kilowatts of electrical power.

Engineering and construction management services for this project will be provided by the Birmingham Office of The Rust Engineering Company.

New Unit for Georgia Power's Plant Mitchell

A $22-million generating unit, which will be added to the **Georgia Power Company's** Plant Mitchell near Albany will almost triple the plant's size and generating capacity.

Presently, Plant Mitchell has two generating units with a total capacity of 45,000 kilowatts. Construction of the 125,000-kilowatt unit will begin either late this year or early in 1962. Engineering studies and design work are currently under way. Approximately $250,000 will be spent on the project this year. It is scheduled to go into service in April, 1964.

The new unit, to be added to the east side of the existing plant, will be equipped to burn coal.

Vulcan-Associated Conference — Ala.

Executives from the seven plants of Vulcan-Associated Container Companies, Inc., recently held a two-day managerial conference at the headquarters in Birmingham, Alabama.

Plans were discussed for a stepped-up program of sales and service and personalized cooperation by each plant with its customers and prospective container users.

Those attending the meeting included Gordon D. Zuck, president; Fred A. Kusta, executive vice-president; David W. Lynch, general sales manager, and other officers.

Vulcan-Associated Container Companies, Inc., through its modern plants, emphasizes service on a local level to manufacturers and packagers of paints and lacquers, food products, oils and greases, and many chemicals and speciality products.

PLANT PERSONNEL

Succeeding **T. J. Meyer** as chief corporate engineer for Riegel Textile Corporation at Ware Shoals, S. C., is **F. K. Yarborough.** In addition to his extensive textile experience, Mr. Yarborough was at one time employed by Duke Power Company.

Robert M. Glidden is the newly appointed staff assistant to **G. Gilbert Wood,** plant manager for Metals & Controls Inc., Versailles, Kentucky, a division of Texas Instruments Inc. **Robert S. Todd** replaces Mr. Glidden as marketing manager of commercial controls.

Paul E. Garrett has been named technical superintendent of the Fredericksburg, Virginia plant of American Viscose Corporation. **Edward L. Woolley** is plant manager.

FUTURE EVENTS of Engineering Interest

May 1-4: Rural Electric Generating Cooperative Conference. Battle House Hotel, Mobile, Ala. D. E. Smithson, Chm. Prog. Plan. Comm., Alabama Electric Coop., Inc., P. O. Drawer 551, Andalusia, Ala.

May 19: Permian Basin Regional Meeting. Natural Gasoline Assn. of America, The Lincoln Hotel, Odessa, Texas. Wm. F. Lowe, Exec. Dir., 421 Kennedy Bldg., Tulsa 3, Okla.

May 22-25: Design Engineering Show & Conference. Cobo Hall, Detroit, Mich. Clapp & Poliak, Inc., 341 Madison Ave., New York 17, N. Y.

Aug. 14-17: 9th Annual Short Course in Fundamentals of Occupational Safety. Louisiana State University, Baton Rouge, La. Fred H. Fenn, Dean, College of Engineering.

Oct. 9-11: 17th Annual National Electronics Conference & Exhibition. International Amphitheatre and Hotel Sherman, Chicago, Ill. John S. Powers, Exhibits Chm., 228 N. LaSalle St., Chicago 1.

VEPCO Plans New W. Va. Power Station

Plans to build a large steam electric power station in West Virginia were announced by A. H. McDowell, Jr., President of the **Virginia Electric and Power Company.** As presently planned, this station will ultimately cost at least $150,000,000 and have a total capacity of more than 1,000,000 kilowatts.

There are numerous technical and other problems to be solved, Mr. McDowell said. It is hoped to in-

stall the first unit of at least 250,000 kilowatts capacity on the Stony River in Grant County, about 20 miles northwest of Petersburg, West Virginia, by 1965. To meet expected load growth, new generating capacity must be added at the rate of about 220,000 kilowatts per year during the next five years. Vepco's system growth load has averaged 11.3 per cent during the period 1950-1960.

The Stony River Station will be of conventional design and will include all the necessary auxiliaries and equipment required for safe, reliable and efficient operation. The electric switchyard and substation also will be of conventional design. Current generated at the station will be transmitted by two or more 230,000 volt transmission lines. In addition to the station, Vepco also will construct a dam, which will impound a 1,200-acre reservoir to be used for cooling purposes.

Fluor Maintenance for Mobil Chemical Plant

Fluor Maintenance, Inc., has been awarded a contract by **Mobil Chemical Company** to perform day-to-day maintenance on a new ethylene plant at Beaumont, Texas.

A force of up to 50 craftsmen will be required to service the facility, which recently went on stream.

Allis-Chalmers Names New Distributors

Allis-Chalmers Manufacturing Company has announced the appointment of the following new motor-generator distributors:

Commercial Electric Motors, Inc., 113 South Alice, Monahans, Texas, headed by A. D. Scott.

Georgia-Tennessee Supply Co., 425 Green St., S.E., Gainesville, Georgia, owned by C. F. Hazen.

Upchurch Electrical Supply Co., 612 W. Center St., Fayetteville, Arkansas, headed by Joe A. Upchurch.

TRW Computers — S.W.

Lloyd Skaggs has joined the staff of **TRW Computers Company** as district sales manager at the company offices in the Esperson Building, Houston, Texas. He will be responsible for application and sales of control computer systems in the Southwest region.

Cesco Dumpers — Texas

Conveyors & Dumpers, Inc., Division of Mercury Industries, manufacturer of Cesco Dumpers for processing industries, announces the

appointment of Industrial Handling Engineers, 2115 Lexington Ave., Houston 6, as representative for all of Texas except the El Paso area. The Houston firm provides a complete sales engineering staff directed by Joseph F. Reilly, Jr.

Walworth — Western Div. Sales Mgr.

Walworth Company, a leading valve and fitting manufacturer, has announced the appointment of Michael C. Malloy to the position of Western Divisional Sales Manager,

Lubricated Plug Valve Division. Situated in the heart of the oil and gas country, Houston, Texas, this division is completely set up to handle sales and service.

Mr. Malloy has had three years with the company and its subsidiary, Grove Valve and Regulator Company, as sales engineer. He is a member of the American Gas Association.

J. O. Ross — Atlanta

Denver Cunningham has recently joined the sales engineering department of J. O. Ross Engineering Division Midland-Ross Corporation.

He will have headquarters in the Atlanta office and handle sales of high temperature and special drying equipment in such industries as tobacco, metal finishing, and textiles.

Mr. Cunningham has a wide background of experience in the textile and chemical fields and until recently was Atlanta Regional Sales Manager of Procter and Schwartz Co.

Subox — Ala. & N. W. Fla.

The Godfrey W. Glenn Agency, 3205 Second Ave., South, Birmingham, Ala., has been appointed representative for **Subox Inc.,** in Alabama and northwest Florida.

George Wallace, who formerly covered this territory for Subox, has now been assigned to West Virginia and western Pennsylvania. He will continue to cover Virginia and the Carolinas.

Conoflow — Tulsa

The Hess Company, P. O. Box 7336, Tulsa, Okla., has been named exclusive sales representative in that area for **Conoflow Corporation,** manufacturer of final control elements.

Robert G. Hess, principal of the Tulsa company, is an engineering graduate of Oklahoma State University, and has had extensive sales experience in the process control field. He is a member of the Instrument Society of America.

Dunn Engineering Corp. Appoints Florida Firm

Whitney A. Brown of W. A. Brown and Associates, Inc., Indian River City, Fla., has been named sales representative for **Dunn Engineering Corporation,** Cambridge, Mass.

Dunn specializes in the design and manufacture of advanced electronics systems and test facilities for inertial guidance and other missile systems.

Mr. Brown will represent the company in Alabama, Delaware, Florida, Georgia, Kentucky, Maryland, Mississippi, North Carolina, South Carolina, Tennessee, Virginia, West Virginia, and the Dictrict of Columbia.

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Coals differ in their characteristics — that's why General strives to make sure you get the proper coal for your particular application. We endeavor to insure that every car of coal we ship meets the specific need for which it is intended.

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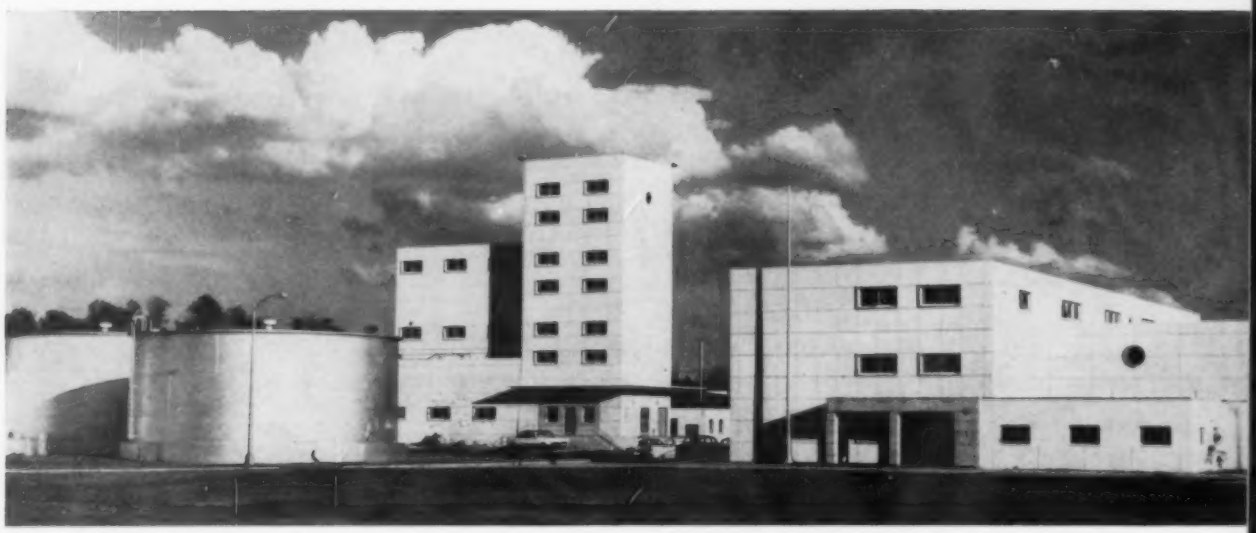
Branches: Buffalo, N. Y.; Charlotte, N. C.; Cincinnati, Cleveland, Ohio; New York, N. Y.; Norfolk, Va.

For more information, Use Reply Card—Page 85

H. T. Oberly, Superintendent of the Water Department, St. Petersburg, Florida, shown leaving the Municipal Water Works Building. The efficient, modern Cosme pumping station shown below is one of two serving the growing St. Petersburg area.



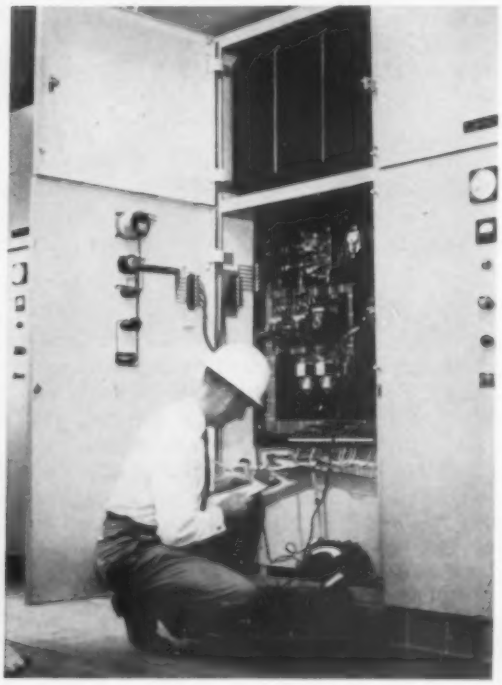
"The Westinghouse Inspection Contract is the best maintenance investment the city Water Department ever made"

says Mr. H. T. Oberly, Superintendent of Water Works, St. Petersburg, Florida

During initial inspections at the two St. Petersburg Water Works pumping stations, Westinghouse Field Service Engineers discovered two serious problems. Without immediate action, these defects could have caused water shortage emergencies in the city. Insulating oil in a power transformer at one site had a dangerously high acid content . . . needed immediate filtering and retreating. In the second instance, a stand-by generator was found to have a grounded field coil. The unit has always been used in emergencies and during heavy electric storms. It is routine operation to switch to an emergency generator in these instances. It has a weekly hour's run if there have been no power failures.

Mr. Putnam, Supervisor of Washington Terrace station and Roy Love, Westinghouse Field Service Engineer, check the layout of the transmission portion of the pumping station. Power coming into this substation is used to run the pumping equipment.

Westinghouse Field Service Engineer inspects, tests and makes minor adjustments on all the electrical equipment in one of the St. Petersburg pumping stations. Pictured is one of the thorough electrical checks on the control circuits.



The St. Petersburg Municipal Water Works signed up for the Westinghouse Maintenance Inspection Contract a little over a year ago to cover the Washington Terrace and Cosme pumping stations. In addition to exhaustive checks of the electrical system, the Westinghouse Field Service Engineer inspects all the electrical controls and rotating equipment. Mr. H. T. Oberly says it's the best maintenance investment his Water Department ever made.

You can now have a Westinghouse Field Service Engineer check and test all your electrical equipment under contract—weekly, monthly or yearly, depending upon your needs. Behind him he has the complete resources, research, engineering, man power and facilities of Westinghouse. These scheduled inspections, adjustments and recommendations can prevent equipment failure, reduce outages and down time to a minimum. Yet your cost is amazingly low . . . generally, much less than 1 percent of the value of your equipment.

For complete information, call your Westinghouse sales office or write: Westinghouse Electric Corporation, 1299 Northside Drive, N.W., Atlanta 2, Ga. (*Available in the Westinghouse Southeast Region only.*) J-95212 B

Westinghouse

INDUSTRY SPEAKS

The Individual in a Corporate Society

ORGANIZATIONS are looked upon today as the responsible instrument of human achievement: The national conviction seems to be, in fact, that "Nothing whatever can be accomplished without organization of some sort."

Consequently, the problem of our society, a problem which is common to each of its many elements, is "how best to preserve the creative power of the individual in the face of the need for organization."

Mr. Crawford H. Greenewalt, President of the Du Pont Company, made the above comments in an important address. Then he went on to warn against conformity. "To many people conformity to a mass pattern represents an alluring state — dangerous alike to the individual and to organizational success. A comfortable sense of ease which goes with the protective coloring of security and depersonalization may be reassuring to individuals but to the organization it can bring only a descent to mediocrity."

The advancement of any organization will come, not from conformity, but from providing "a climate of achievement in which men of ordinary stature are somehow stimulated to extraordinary performance," he said. But noting "a strong body of opinion which assumes that the conformist is the boy who gets ahead," Mr. Greenewalt disagreed:

"I have yet to see a man make his way to the upper levels by conforming to any precast or prefabricated mold. I have seen many fail by following such a course. And I have seen far more fail by pursuing conventional approaches than I have ever seen fail by ignoring them."

Living within an organization is a very real problem which should be fully recognized, he said. "There is an inherent danger in man's involvement with large numbers of his kind; men as well as children can lose their way in crowds."

But the problem "is not solely one of protection for the individual — it is in some respects one which involves protecting the organization itself from the stagnation created by those who find that 'conformity' like vice, can first be endured, and finally embraced. The unhappy fact is that conformity is for some an alluring state, a condition representing the course of least resistance. All too many, I am afraid, reach a point at which they seek refuge in protective coloring, with security replacing accomplishment as the primary goal," he said.

"When this happens, instead of the individual becoming the victim of pressures within the organization, it is the organization that falls prey to organization men.

"The extent to which any given individual can produce beyond his rated capacity may be very small, yet the sum of these, added together, will make the difference between a great organization and an indifferent one."

Mr. Greenewalt warned against the confusion between voluntary conformity of behavior, such as good manners, and "enforced conformity of thought which represents an invasion of personal rights and a brake upon our capacity to follow our own destinies."

People conform to the amenities to get along with each other but there is a great difference between this and "the compulsions toward unified thought," he said. "Conformity in behavior is a necessity; conformity in patterns of thought is a danger. Unfortunately, people have come in modern times to mistake one for the other.

"Obviously the process, through which common men perform uncommon deeds, cannot endure in the face of anything that deprives the individual of his dignity or his importance. Nor can it exist in our intricate day and age in an atmosphere of anarchy which ignores the need for close relationship and group effort. Somewhere between the two lies the middle ground through which men can find their way to satisfying careers and on which the organization can find its most effective pace.

"Achievement, after all, begins with the human intellect. Organizations, perhaps unfortunately, are without this God-given capacity. They exist and prosper only as they can give free rein to the minds and spirits of their people. When they cease to do so they cease to be organizations and become, first, empty shells, then anachronisms, and finally memories. Only man's intellect and spirit, after all, are vital, sanctified and immortal."

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TIMELY COMMENTS

What Do You Hear Out In The Plant

HOW CAN YOU quickly recognize a well maintained plant? By its sound! Every plant has an in-tune hum, characteristic of the particular industry. Odd noises here and there that don't fit the tune pattern nearly always indicate trouble or potential trouble. Even before you can smell a hot bearing or see a loose bolt, there are likely to be inharmonious noises.

The above is mentioned merely to emphasize the need for frequent plant tours by the maintenance engineer. No matter how thorough the inspections, or how diligent the mechanics, things will go wrong — and incipient trouble can frequently be spotted before failure by just walking through the plant.

Such tours also help maintain contact with operators so that little things "too small for a formal report" can be pointed out.

The watch-and-listen procedure is an important tool of the maintenance supervisor. That is how he develops the much desired reputation of always being ready.

True, the good maintenance man must be a good improvisor — able to get the emergency job done with what he *has available*. But even more important, he nearly always *has available* what is needed.

These common sense earmarks of a good maintenance man are perhaps endangered by too much scheduling, and too detailed inspection forms. The preventive maintenance program must provide time and materials to do the work according to schedule. But it must also permit opportunity for a man to grow and develop his own ingenuity and gift of inventiveness. Otherwise he won't know what to do when the plant suddenly goes out of tune. Or, worse still, he may not even recognize a discord when he hears it.

All of the above points to the continued need for recruiting and training real maintenance engineers — men that have an ear for the job.

After the young maintenance men are given the orientation and apprentice routines according to formula, some way must be found to help them develop the brain power and alertness that are needed — intuition, if you want a fancy word for it.

You can't get intelligence and initiative from books — and you can't get it in a plant where the men are always told exactly what to do, and how and when to do it. Somewhere along the line the worker must be allowed to develop his "gift for inventiveness."

Glenn R. Cowan, coordinator of work simplification for The B. F. Goodrich Company, emphasized this point very well recently when he told the Pittsburgh chapter of the American Institute of Industrial Engineers, "creative thinking abilities of American workers is a neglected resource. American Industry must enlist the brainpower of all its employees if it is to win the struggle against foreign competition.

He urged special programs by management to encourage inventiveness in workers.

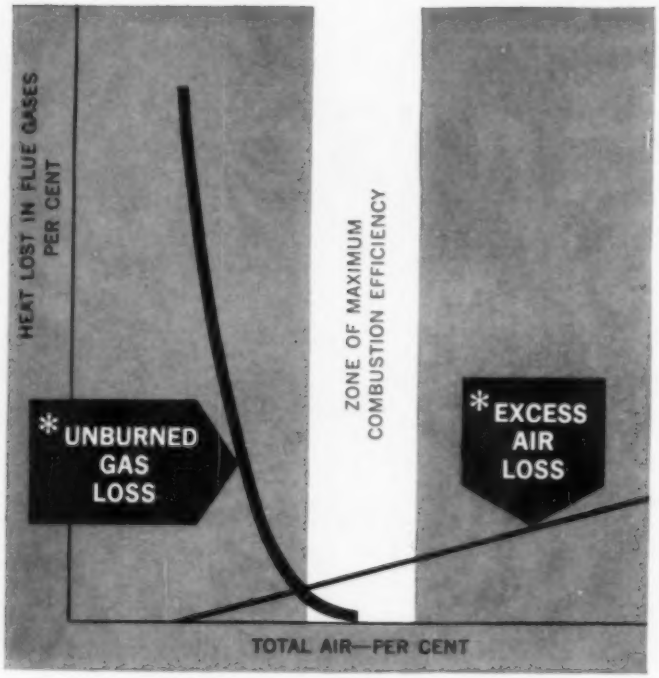
"It is necessary to stimulate most employees to use their natural creative thinking abilities. Most adults need opportunities to demonstrate their creativity," he said.

"Americans still have the gift of inventiveness that made us a great industrial nation, but modern industry assigns creative work to specialists and often neglects to seek out and develop the ideas of its ordinary managers and workers. Countless thousands of valuable ideas are lost in this way.

"It is difficult for American manufacturers to compete with low foreign wage rates, but we can still do it if we will only utilize the superior capabilities of the American worker. We must use all our brainpower to find new ways of cutting production costs."

Mr. Cowan pointed out that B. F. Goodrich had achieved striking gains in productivity and cost reduction through a program to stimulate employee participation in its improvement projects.

You must know BOTH* to get maximum combustion efficiency!

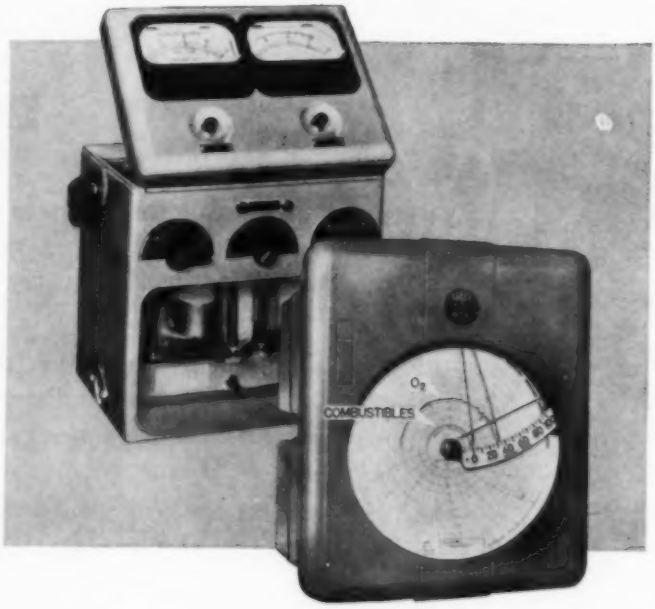

HEAT LOST IN FLUE GASES PER CENT
ZONE OF MAXIMUM COMBUSTION EFFICIENCY
* UNBURNED GAS LOSS
* EXCESS AIR LOSS
TOTAL AIR—PER CENT

How much money is going up the flue in *unburned fuel* losses? Is too much air resulting in excessive *heat* losses?

You must know *both* facts—simultaneously—to get optimum combustion. No instrument that measures only one of these interdependent factors can give you the full information you need.

Bailey offers a choice of two direct ways to maintain a continuous and simultaneous double check on these factors that determine combustion efficiency. The portable, lightweight Bailey HEAT PROVER Analyzer indicates both; the Bailey Oxygen-Combustibles Analyzer-Recorder records both on a single chart. Both instruments measure excess air, regardless of fuel or fuels being burned, and per cent of combustibles in flue gas.

Either of these Bailey instruments can save you far more than their cost in spotlighting combustion inefficiencies. Ask your Bailey engineer or write for product specifications.



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G 135-1

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you better rail service. But they tell only part of the story!

To assure the closest possible coordination of Southern's service and sales functions, we have created the new post of Executive Vice-President with jurisdiction over our Operating and Traffic Departments. To give faster, more effective action on pricing matters, we have consolidated our rates and divisions offices. And to make available to eligible customers the advantages of more time in which to pay freight bills, we have liberalized credit terms on carload freight.

All of this is the prologue. More is to come! Because now, more than ever, Southern is accenting the needs of the shippers and the receivers it serves.

Try us and see if you don't agree that *Southern's accent is on you!*

SOUTHERN RAILWAY SYSTEM

How You Can Use the Clamp-On Volt-Ammeter to

Quickly Find Electrical Troubles

By **NED THOMPSON**
Electrical Engineer
Thompson Electric Co.
Texarkana, Texas

EVER HAVE a vital machine in your production process shut-down from electrical trouble? Every plant goes through this annoying and costly experience. And each time it occurs, there is a "down-time" entry in the report.

Many times when the down-time entry in the report reads, "50 minutes," it may well have read only "25 minutes," if a *clamp-on volt-ammeter* had been put to good use for regular inspection during the case of trouble.

We are a contract shop, handling electrical maintenance and repairs for several industrial plants, in a fifty-mile area of Arkansas and Texas. We have customers in various industries: wood-working, clay products, fertilizer, printing, thermal insulation, oil field, metal fabrication, cement, sand and gravel, etc.

We find in almost all of these plants a great opportunity for effective use of the clamp-on volt-ammeter.

Testing for Trouble

The meter is not a substitute for brains and energy, but it can help. There must be background diagnosis, and interpretation, of each situation. For example, a 10 horsepower, 3-phase, induction motor, belt-driving a machine, has been put under test because the operator complains that the machine seems to be slowing down while in production. The ammeter reading is 20% above the motor name plate rating.

One cause of this trouble could be mechanical fault in the machine, placing an overload on the motor.

MR. THOMPSON was born in Pine Bluff, Arkansas, and has spent 40 of his 51 years in the Texas-Arkansas border area. He has a degree in Electrical Engineering from the University of the West. He also attended Marquette University and is a member of the American Institute of Electrical Engineers. He states that his best experience in the Electrical Field came during World War Two, when for four years he supervised five electrical departments for Lone Star Ordnance Plant, near Texarkana.

For 15 years he has operated Thompson Electric Company, servicing electrical equipment for scores of small industrial plants in the Texarkana area. His Company has complete motor rewind and repair facilities, as well as field service technicians. He has written two Instruction Booklets for Electricians. Mr. Thompson is serving in his eleventh year as a member of the Texarkana Electrical Examining Board.

And the clamp-on meter would be faithful to indicate such, by registering the higher-than-normal load amperage. However, it would be premature to assume conclusively that the driven machine is mechanically overloading the motor.

Here are some of the other conditions that could be present, to give just such a 20% over-load amperage reading, as well as slowing the driven machine.

1. Worn motor bearings, allowing the belt-pull to drag the rotor in the stator laminations of the motor.

2. One broken, or burned-open coil wire in a two-circuit Star or Delta motor winding.

3. Dry motor bearings, causing a drag and binding of the rotor shaft.

4. Low voltage supplied to the motor.

5. Open or loose bars in the induction rotor.

6. V-Belts set too tight. This can add an almost unbelievable overload without much evidence of belt or bearing distress.

The foregoing is intended to illustrate to the reader that the clamp-on does not completely pinpoint the trouble or defect. It is simply an excellent tool, with which we may easily learn to analyze cases of trouble, and with which we may catalog the conditions of electrical motors and devices when the plant is in normal operation.

Test-Card Data

For instance, in the above trouble case, suppose routine tests and readings had previously been made on this 10 hp machine, perhaps a month or more ago while the machine was in normal production. And a permanent heavy test tag was attached to the magnetic starter, stating that the voltage with the machine loaded was 465, and the load amperage was 11. The idle amperage was 7½, and with belts off the amperage was 4½.

Now we have something as a basis for diagnosis, for pin-pointing the trouble, when we read the 20% higher amperage. We know, from the test-card, that the amperage is 7½ with the machine running idle, or unloaded. So, after feeling the motor bearings for excessive heat, we ask the operator to unload the machine. Then suppose our clamp-on reads 10 or 10½ amp,

Fig. 1. Upper Left — Testing for loose or open bars in induction motor, making use of clamp-on and growler.

Fig. 2. Upper Right — Electrician demonstrates use of clamp-on meter for routine test at 30 hp motor starter.

Fig. 3. Lower Left — Testing rewound motor for idle running amperes with clamp-on volt-ammeter.

Fig. 4. Lower Right — Electrician using clamp-on meter to check current on 200 hp extruder motor.

pulling the machine idle, while the voltage is 465, or normal. This is 3 amp in excess of normal.

Here we have definite grounds for calling in the millwright, or mechanic. But wait; let's be a little more sure. The driving belts could be removed, and the motor amp then should be 4⅛, according to the test-card. If this is done, with the above result, then the logical course is for the machine mechanic to check for faults in the driven machine.

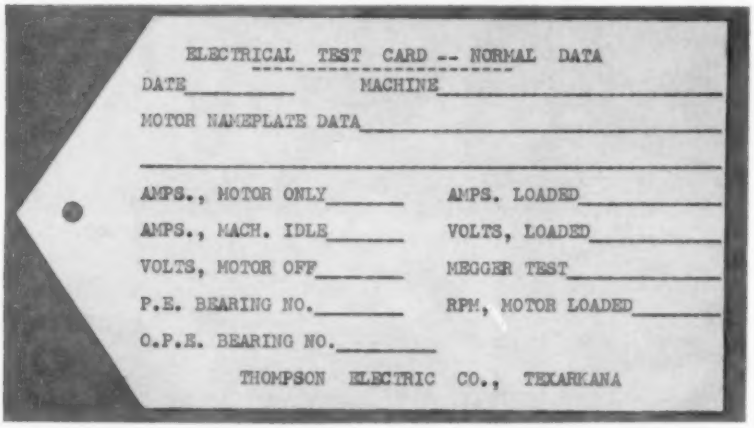
Open Rotor Bars

Of course, this still leaves a motor condition possible that could be the trouble in the example above. It is condition #5: open or loose bars in the induction rotor. This could be the defect, and the above clamp-on readings hold true. However, the slip, or loss of speed, in the motor and machine would have been very noticeable with the above readings. Later in this article, it will be shown how the clamp-on volt-ammeter is used in testing rotors for loose or open bars.

Data at the Machine

You will notice that the key to the quick analysis of the trouble in the above example lay in the use

of the permanent test-card attached to the magnetic starter. In actual practice, our field technician, or the plant maintenance electrician, would have more information recorded on the test-card than given above. For instance, a megger test of the motor winding insulation would be made and recorded. Also tachometer reading with the machine under load, and the load rpm recorded. These and other data would be useful to speed repairs in case of breakdowns.


ELECTRICAL TEST CARD -- NORMAL DATA

DATE_____ MACHINE_____

MOTOR NAMEPLATE DATA_____

_____

AMPS., MOTOR ONLY_____ AMPS. LOADED_____

AMPS., MACH. IDLE_____ VOLTS, LOADED_____

VOLTS, MOTOR OFF_____ MEGGER TEST_____

P.E. BEARING NO._____ RPM, MOTOR LOADED_____

O.P.E. BEARING NO._____

THOMPSON ELECTRIC CO., TEXARKANA

A permanent test-card attached to the equipment greatly aids on-the-job trouble analysis.

You ask, why should the test-card be attached to the magnetic starter? Why not record routine tests on regular equipment file cards kept in the office? Perhaps yes, in some large organizations. But in general, several reasons can be cited in support of the attached test-card.

First, without the attached test-card, the electrician will usually exhaust all customary tests in an effort to find and clear the trouble when called to a breakdown in the production machinery. After this, he may then go to the maintenance files, and lose valuable time in a search for the performance data needed.

Second, with the data card filed away in the office, some changes may be made in the wiring or operation of the production machine and not recorded. Here is a possibility of wrong data being kept on a vital cog in the production wheel. Whereas, with a test-card attached to the motor starter, a change in the wiring or operation would be caught and entered on the test-card at the time of the change — right on-the-job.

There are several good clamp-on volt-ammeters on the market. The one you choose for your maintenance tool needs to be a precision instrument, accurate in different temperatures, etc. A high grade instrument, guaranteed within a plus/minus 2% accuracy, will repay you in test results. The usual meters seen are the alternating current types, with voltage scales of 150-300-750, and amperage scales of 10-50-150-600. There are also several direct current meters on the market, with scales approximating the above values.

Now let's outline some of the techniques of using the clamp-on meter, that may give the readings more meaning to the maintenance electrician.

Fluctuating Ampere Readings

Some motor loads are of such nature that fluctuations in the ampere readings are to be expected: Air compressors, elevators, machine rolls, log-saws, hammer-mills, oil-well drives, conveyors, etc. In testing such equipment, it is desirable to try to arrive at an average load reading. A rip-saw motor, for instance, rated at 47 amp, will draw high amperage while the thick or hard cut goes through, and lower amperage for a light cut.

Assuming that continuous feed is the work of this rip-saw, the average load of the motor would be the median of the average swing of the ampere needle, from high to low. Keep in mind, of course, that hard cuts that keep the needle very far above 47 amp will put an overload on the motor. We have found that a good, acceptable condition of load in this size and type of operation is a fluctuating reading from about 35 amp on the lighter cuts, to 50 amp on the harder cuts.

An oil-well drive of the beam type, on the other hand, may take 4 seconds to complete a cycle. Our same motor, rated 47 amp, will draw current proportional to the amount of counter-weight adjustment. The ampere reading will peak twice in each cycle of pumping. That is, once at the mid-point of the down-stroke, and again at the mid-point of the up-stroke. One peak can be different from the other, depending upon the adjustment of the counter-weights on the fly-wheel.

In fact, the clamp-on meter can be used effectively to adjust the counter-weights, to bring the up-stroke load to equal the down-stroke load. It can readily be seen that the lower levels of the amperage load will be reached as the pump stroke comes to the end of either up or down movement.

In using the clamp-on meter, either for voltage test, or amperage test, it is necessary to take readings on all three phases of a three-phase system. This can forestall a wrong conclusion that trouble is in the motor, when actually testing another phase may indicate that a primary transformer fuse is blown in the supply. In normal routine tests, for test-card entries, it is best to average the readings of all three phases, and enter this as the data voltage or amperage.

When recording test-card data for large synchronous or slip-ring motors, it is desirable to record the readings of the separate phases, A-B-C, reading from left to right, facing the controlled. Since this is a local data-card, for this motor only, it will not matter if phase lettering is different from other locations in the plant.

Constant Ampere Readings

Some motor loads are quite constant, or steady in nature: Cen-

(Continued on page 82)

Get New Equipment Off to a Good Start

Start Maintenance Early

By ROY A. ANDERSON

Maintenance Foreman, Plastics Division
Diamond Alkali Company, Deer Park, Texas

A PROBLEM facing maintenance men in every growing industrial organization is how to integrate new plant equipment into an existing preventive maintenance system with maximum ease and benefit. The problem must be tackled *before*, not after, construction of a new factory or the expansion of an existing plant is completed.

It is from these standpoints chiefly that ideas and methods gleaned from accumulated experience at Diamond Alkali Company's Plastics Plant at Deer Park, Texas, may possibly prove of interest and value to other plant maintenance men now wrestling with this important, and not too frequently appreciated, problem.

In any new plant development or expansion, we have found that attention to equipment maintenance starts during the engineering and construction phases of the project. As plot plans are received, they are carefully reviewed and analyzed for equipment accessibility. Clearances required for removal of heads, pistons and tube bundles—removal of entire units by chain hoist or yard crane—particularly merit thorough study.

Check Lists

Upon receipt of the equipment and instrument lists, the check lists are prepared. Exhibit 1 shows the mechanical list. The same method is used for instruments, using appropriate columns. The check lists are tacked on a board located in the Maintenance Foreman's office. As various steps are completed, the appropriate block is checked. A quick glance at the board will inform the Maintenance Foreman of the status of inspection of any equipment or instrument.

As soon as the specifications are received they are checked for conformity to established standards, and for utilization of existing spare parts and surplus equipment wherever and whenever feasible.

The data cards are then filled out with all pertinent information of the unit. The data of all units requiring preventive maintenance is entered on preventive maintenance cards set up for the purpose. The data of all other units such as vessels, heat exchangers, switches, block valves, etc., are entered on a 3" x 5" card which is then filed in a card drawer. The information entered is such that would be helpful in tracing or reordering replacements.

Such information could be the job title, item number, manufacturer, vendor, P/O number, cost, nameplate data, size of belts, sheaves, chains, sprockets, description of bearings, etc. The cards are filled out as the information is available from the receipt of the lists to the physical receipt of the unit.

Large equipment units are inspected as shortly as possible after receipt for structural and other defects, damage encountered in transit and signs of corrosion. The unit is checked by nameplate data as well as physical observation for conformity to the specification. Any deviation or discrepancy is called to the attention of the project engineer.

The manufacturers' instruction manuals are carefully studied with special emphasis on installation. Articles and items pertaining to start-up and operation are earmarked for future reference.

During installation, equipment is usually blinded off to prevent entrance of foreign matter such as welding slag. We have found, however, that foreign particles do enter the unit at times. This has led to partial dismantling of the units for inspection. The wisdom of this step is perhaps best illustrated by the following examples.

In one of our areas we had encountered considerable difficulty with the gear reducers of a bank of agitators. At a recent expansion involving a similar bank of agitators, it was decided to inspect the gears. We found improper pinion and clearance and mismatched pinion and gear combinations. These defects were corrected by the manufacturer at his expense, of course, and it eliminated possible future trouble for us.

In another instance, a rotary compressor head was removed to inspect the internal areas for welding slag, rags and other foreign matter prior to rotating unit by hand. It was found that the manufacturer had failed to coat the internal surfaces with a rust preventive; all surfaces had become badly rusted. Other units were opened and a similar condition was discovered. Complete dismantling of units and honing all surfaces were required before equipment could be put into use safely.

Another instance, one of our units has large roller bearings on the trunnion shaft. According to the manufacturer's manual, these bearings had been lubricated at the factory, thus requiring no

Exhibit #1

ITEM	EQUIPMENT	Requisitioned	Ordered	P/O - Spec. Check	Received as Ordered	Damage Check	Instruction Manual Rec'd.	Spare Parts List Rec'd.	Spare Parts Ordered	Unit Alignment Checked	Pipe Line Strain Checked	Coupling Alignm't. Checked	Suction Strainer	Motor Meggered	Motor Rotation Checked	Unit Lubricated	Preventive Maint. Set Up	Electrical Dept. Clearance	Readiness Report Issued
		EQUIPMENT																	
101	Agitator (Blend Tank)																		
102	Pump (Head Tank)																		
177	Conveyor (Bagging)																		
178	Fork Lift Truck																		
179	Screen (Copolymer)																		

Exhibit #2

EQUIPMENT READINESS REPORT

To: Production Foreman Date: _____

From: Maintenance Foreman

Item Number: _____ Equipment: _____

This will advise that the subject equipment has been checked this date, mechanically and electrically, and is considered ready for operation.

Please notify the Maintenance Department when this equipment is to be initially started, in order that the operational characteristics might be observed.

Signed: _____
Maintenance Foreman

further lubrication for start-up. Inspection revealed one bearing totally void of lubricant. Had the unit been operated without this inspection, a failure most certainly would have resulted.

Preoperation Inspection

The crankcases of all large reciprocating compressors are opened up for inspection. Deflection readings of the cranks are taken and recorded. Periodic readings will assist in determining the wear of the babbitted main bearings. This will enable us to make whatever adjustments are necessary before major damage occurs.

Casing covers of centrifugal pumps are removed and internal surfaces inspected for foreign matter. After pipe lines are cleaned and flushed out, covers are replaced and line strainers installed in suction line. Pipe connections at pumps are checked for any possible evidence of strain.

Couplings are checked for alignment, then connected. Motors are checked for insulation resistance to ground by an electrician before field installation. During a run-in period, heat pickup and bearing conditions are noted. Motors are likewise field-checked for accessibility of junction box and ease of removal.

Instrument Checks

Instruments are shop-checked before field installation. Meters are calibrated, control valves dismantled, and internal parts checked for conformity to specifications. Safety valves are dismantled, inspected and reset. On one occasion, a flaw was found in a safety valve nozzle so close to the seating area that subsequent machining would have made the nozzle useless. Upon cleaning the valve with solvent,

the protective coat of aluminum paint on the body washed off, revealing the presence of mill scale. Needless to say, this valve was promptly returned to the vendor.

Proper location of unions and flanges is essential to permit ease of unit removal. On control valves equipped with a by-pass, it is common to find unions installed in such a way that removal of unit would be difficult due to the ball joints. Our practice is to install the control valve on the by-pass line with one of the unions on the opposite side of an elbow. If this is not practical, we change to flanges.

All piping is hydrostatically or pneumatically tested after the flux has been removed from welds and prior to application of paint. Water used in hydrostatic tests should be maintained at normal temperature; otherwise, undue stresses may result. Immediately following pressure-testing, all lines and vessels are depressured and, in the case of hydrostatics, all water is drained and the system blown out with air. Prior to pressure-testing all vessels and equipment are blinded.

Painting

Painting specifications require adherence to the letter. The life of the particular paint system used depends upon proper surface preparation. "Hard-to-get-at" places are generally checked with a mirror because when scale has formed they become harder-to-get-at for maintenance painters. This mirror inspection often reveals many unprimed areas.

Design engineers sometimes overlook the problems of accessibility for maintenance painting — for example, structural steel too close to walls and other obstructions — to permit proper surface preparation and adequate paint coverage. Design considerations should also include provision for pad eyes and clips which will enable painters to rig stagings in high places properly and safely.

Safety

During the construction phase, a close inspection should be made for safe accessibility to equipment for maintenance work. Installation of platforms, gratings and handrails around equipment can save many man-hours and minimize downtime loss.

We have seen many pressure transmitters installed in areas or locations so inaccessible as to make "zeroing" on the line impossible. We have also seen the removal of instruments on the panelboard made impossible due to tubing, conduits and fittings installed in the clearance area required for instrument removal.

Spare Parts

The manufacturer's spare parts recommendations are studied. Experience proves the best guide for determining equipment parts most susceptible to failure. The priority of the particular equipment in the production line should be determined.

Lubrication Standards

A list was made of the various lubricants recommended by equipment manufacturers. This list, like Topsy, "just grew." By lubricant standardization, we substantially shortened it. Result: A sizable saving of space and inventory investment, plus development of a greatly simplified lubrication list.

On-the-Job Attention

The maintenance foreman works very closely with the construction superintendent and the field engineer during field inspections. He is constantly on the lookout for potential safety hazards, points of corrosion, or any other trouble sources which conceivably could require future remedial attention at the expense of his maintenance budget.

Maintenance Schedule

The accumulation of knowledge gained in the study of manufacturer's operating instructions and service manuals, and inspection of the unit's component parts assist in formulating a preventive maintenance schedule. Past experience offers the greatest help of course.

The most effective preventive maintenance program devised is useless, however, unless inspectors and oilers follow instructions. Therefore, manuals are always made available and their constant use encouraged. Policies governing minor procedural details in making inspections are drawn up and posted. A discussion is always held with these men after they have completed their inspections.

Start-Up Time

After all equipment inspections have been completed, the production foreman is notified by means of a special form (See Exhibit II), which indicates that the particular unit has been electrically and mechanically checked.

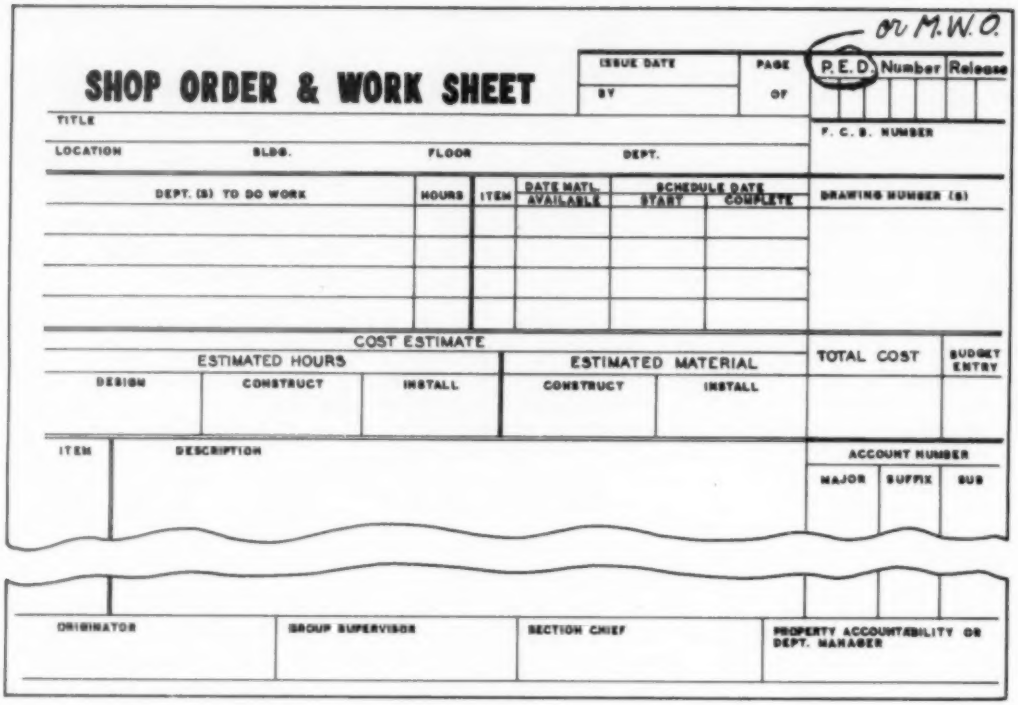
Normally, the necessity of detailed inspection of new equipment along the lines reviewed should not be required. However, our experience with original plant installations, modifications, and expansions clearly demonstrates that not all equipment manufacturers follow full inspection procedures in assembly and shipping.

Personnel

Regular maintenance personnel are not augmented to perform the inspections as equipment arrivals are planned and spread over the construction period, thus permitting maintenance men to fill in on these jobs as they come up. During the last month of construction, however, two mechanics devote full time to final inspections.

Preventive maintenance requires a workable knowledge of machinery. Detection of malfunctions, diagnosis of equipment "pains" and initiation of remedial measures before the condition becomes aggravated all stem from the organization of an inspection system. Proper lubrication, detection of undue stresses causing misalignment, detection of misapplication of equipment and material before extensive damage occurs — all of these are part and parcel of a system which, if properly organized and religiously followed, will prevent unnecessary maintenance and control erosion of profit margins.

One point deserves reemphasis. To get the maximum benefits from any preventive maintenance program, plant management must recognize and appreciate the necessity of starting the program in the design stage of the plant project and keep it uppermost in mind during all phases of design, construction, start-up, and operation. Application of these principles pays real dividends in dependable production continuity, long equipment life, and low operating costs.



SHOP ORDER & WORK SHEET

or M.W.O.

ISSUE DATE | BY | PAGE | OF | P.E.D. Number | Release

TITLE

F. C. B. NUMBER

LOCATION | BLDG. | FLOOR | DEPT.

DEPT. (S) TO DO WORK	HOURS	ITEM	DATE MATL. AVAILABLE	SCHEDULE DATE START	SCHEDULE DATE COMPLETE	DRAWING NUMBER (S)

COST ESTIMATE

ESTIMATED HOURS			ESTIMATED MATERIAL		TOTAL COST	BUDGET ENTRY
DESIGN	CONSTRUCT	INSTALL	CONSTRUCT	INSTALL		

ITEM	DESCRIPTION	ACCOUNT NUMBER MAJOR	SUFFIX	SUB

ORIGINATOR	GROUP SUPERVISOR	SECTION CHIEF	PROPERTY ACCOUNTABILITY OR DEPT. MANAGER

Fig. 1—This form serves both as Plant Engineering Department Work Order and as Maintenance Work Order. Only difference is as marked at upper right.

Performance Ratings Promote Competition in Florida Maintenance Crew

Control for Maintenance

By THOMAS H. STEIDLEY, SR.

Senior Planner
The Martin Company
Orlando, Florida

MAINTENANCE departments throughout industry, generally speaking, have been a "step-child" of performance control programs because of the variety of "one shot" jobs that make up the functions of maintenance and repair, rearrangement and construction, preventive maintenance and utility operations.

Sixty per cent of a possible eighty-five per cent of the total hours worked in the Maintenance Section of The Martin Company, Orlando, Florida are controlled by standard hours allowed for work in process and completed jobs.

Details of this control program are as follows:

Functions Under Control

The sixty per cent coverage, noted above, includes all maintenance and repair items and rearrangement and construction jobs. The balance of twenty-five per cent covering Preventive Maintenance and Utilities Operations, is planned to be controlled by standards by mid-1961.

Documents of Control

All maintenance and repair and rearrangement and construction jobs are authorized by one of the following documents:

1. PED (Plant Engineering Department Work Order—Fig. 1)

2. MWO (Maintenance Work Order—Fig. 1)

3. MRO (Maintenance Repair Order—Fig. 2)

4. Service Request (Service Call Ticket—Fig. 3)

Each of these documents has its respective identifying control number that appears on the weekly IBM tabulated report of actual hours expended by job.

FORM MAR. 60 2003

MAINTENANCE REPAIR ORDER M.R.O. Nº 021256

MARTIN
ORLANDO

Acct. No.	Title	
Model	Maint. Start	Maint. Comp.
Ser. No.	Estimated Hrs.	Actual Hrs.
Equip. No.	Location	Priority

MATERIAL AND PARTS REQUIREMENT

ITEM	QUANTITY	PART NO. OR SIZE	DESCRIPTION

DESCRIPTION OF WORK TO BE ACCOMPLISHED:

DISTRIBUTION OF COPIES:	JOB COMPLETED	APPROVED BY
Original—To Maint. Material Control Duplicate—To Facilities Standards Triplicate—To Originator File		

Fig. 2—Maintenance Repair Order (MRO)

SERVICE REQUEST

Nº 8 54377

DATE / /	TIME RECEIVED ☐ PM ☐ AM	REQUESTED BY
LOCATION	DEPARTMENT	EXTENSION

EQ. NO. ☐
ME NO. ☐
EPF NO. ☐

CHARGE NO. 1

MACHINE REPAIR	MILLWRIGHT	HARDWARE	TRUCKS
ELECTRICIAN	PLUMBER	CARPENTER	OTHER

TIME ASSIGNED ☐ AM ☐ PM	NAME OF WORKMAN ASSIGNED

REPORT

ORL 060116

DATE COMPL.	TIME COMPLETED ☐ AM ☐ PM	WORKMAN'S SIGNATURE

Fig. 3 Service Request

FORM 223 TEMP

M.R.O._____ Hrs.____

SHOP FOREMAN FILL IN ABOVE

MATERIAL SECTION: DETACH AND FORWARD TO P.E. CONTROLS

Fig. 4—Record of Hours

Standard Hours for Control

Standard hours for PED's, MWO's and MRO's are estimated by supervision of the originating groups and logged into a 3" x 5" card file by the Standards Group for credit reference. (Fig. 4)

Standard hours for Service Requests are fixed average hours per category of work performed. There are nine categories with their respective standards, and credit is allowed for a completed job based on the description of work as noted on the Service Request Ticket.

(Continued on next page)

PLANT ENGINEERING DEPARTMENT
Weekly Performance Control Report

Work Center	Section Number / Work Center Description	Week End: 12-25-60 Act.Hrs.	Std.Hrs.	%Per	Cumulative to-date Act.Hrs.	Std.Hrs.	%Per
TOTAL	960 - SECTION HEADS & OFFICE	160	-	-	7118	-	-
00	Supervision & Office	365	-	-	25593	-	-
01	Structural Design	167	155	93	7178	6000	84
02	Mechanical Design	162	122	75	8055	6604	82
03	Electrical Design	222	159	72	8887	7311	82
04	Factory Layout	184	134	73	10500	8593	82
05	Office Layout	192	137	71	11177	9124	82
06	Area Engineering	24	-	-	2610	-	-
TOTAL	961 - PLANT DESIGN & AREA ENG.	1316	-	76	74000	-	82
00	Supervision & Office	724	-	-	54707	-	-
10	First Shift Service - Crew I	495	439	89	27070	23384	86
12	First Shift Service - Crew II	437	351	80	23544	20329	86

Fig. 5—Weekly Performance Control Report

Computing Performance Control

Each employee fills in a daily time slip showing his section number, work center number, account number, control number and actual hours worked per job (job identified by control number). Timekeeping tabulates this data on IBM cards, from which a weekly tab run is compiled and issued consisting of the following information:

Section Number
Account Number
Control Number
Work Center
Actual Hours
Actual Dollars
Overtime Hours
Overtime Dollars

Standard hour credit is allowed by individual control number and computed against actual hours for a performance rating by department, section within the department and work center within the section. Performance ratings are shown for the current week and accumulated for a year-to-date percentage. (See report—Fig. 5.)

Benefits of Control

Performance ratings establish a competitive spirit between supervision resulting in increased output per man.

Manpower requirements can be computed accurately by measuring work load by performance.

Individual job costs can be measured and recorded.

Overtime is controlled on a percentage basis within work centers, sections and department.

Direct and indirect labor hours and dollars may be segregated and accumulated, showing expenditures to-date.

This type of control, using estimates for standards, does not require time study personnel or a group of statisticians. One Industrial Engineer and one statistician maintain the Performance Control Program in addition to many other activities such as budget controls, manpower forecasts, surveys, reports, etc., in the Plant Engineering Department consisting of two hundred fifteen personnel.

Be Ready to Cut

GENERAL PURPOSE cutters to cut most material without damage to the cutting edges have been designed.

Cutters require lubrication. In a tool where the power is multiplied eighty times the handle pressure, friction increases proportionately. All joints and bearings should be kept clean and well oiled. Be sure to oil all along the edge of the jaw straps. Also, keep the jaw bolts and connecting bolts reasonably tight.

Adjustment of the jaws should be made so that a hairline of light can be seen along the cutting edges when the handles are fully closed.

If the few maintenance procedures above are followed, your cutter should give long trouble free service. Occasionally dressing of the cutting edges will become necessary. A sharp 6" mill bastard file is suggested, and original bevels should be maintained. Cutting edges are not intended to be razor sharp . . . leave a slight flat to form a strong durable edge.

When replacement of the cutting jaws is necessary, it is usually best to purchase a complete cutterhead. The time and labor saved by doing this will more than pay the slight additional cost for a cutterhead rather than a pair of jaws.

Courtesy, H. K. PORTER, INC.

Your Compressed Air Accessories May Be Loafing

By DON W. BENNER
Wilkerson Corporation

MANY DEVICES are attached at various points all over a compressed air system. Since these are usually added as the air lines are installed, they are often as forgotten as the air valves themselves. It is not unusual to go through a plant and see air line lubricators empty and air line filters full. This is an obvious sign that a plant has never considered the proper maintenance of compressed air filters, regulators and lubricators.

Filters

A filter full of water is no filter at all. Regular daily routines must be established to drain the filter sump of its contaminants. Once a month the filter bowl should be removed and swished in a solvent not harmful to plastics. At the same time, the filter cartridge should be removed and cleaned. Swishing it in a solvent and blowing it off with air is all that is required.

Failure to do these three things (draining sump, cleaning bowl and cleaning cartridge) will mean that the filter will be flooded and hence useless, the cartridge will be so loaded with dirt it will choke off the flow of air, and the bowl will become so dirty that its transparency is voided and visual inspection of draining period is lost.

Regulators

A regulator, or pressure reducing valve, requires little maintenance. Remove the bottom plug once a month and blow off the inside parts. If there is a screen in the plug, clean it off with air also.

Lubricators

An airline lubricator must have oil in it, of course, to function. Regular daily or weekly filling routines are required, depending upon how much air is used. Determine which lubricator on your air system requires filling most often. Time the routine for all lubricators according to the needs of that one.

If your lubricator has no sight glass by which you can tell if it is operating, you should periodically mark the bowl at the oil level and check it later to see if oil is actually being used. It is strange to hear some maintenance men say they like a certain lubricator because they seldom have to fill it.

Clean the bowl of the lubricator the same as prescribed above for the filter, and for the same reason. Often moisture and dirt settle to the bottom of the bowl, under the oil. Since this is at the entrance of the siphon tube, these contaminants will be picked up first if not removed. They should be drained off through the petcock each time the lubricator is filled.

To make their maintenance less costly, two things should be carefully considered when purchasing products of this type. First, why not purchase automatic-draining filters; and second, be sure lubricator is as easy to fill as possible.

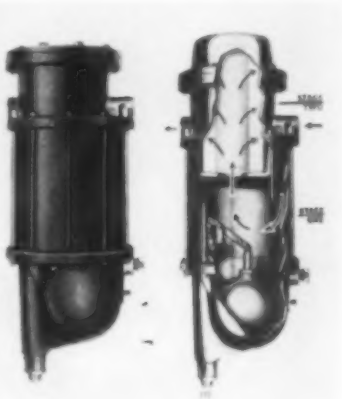
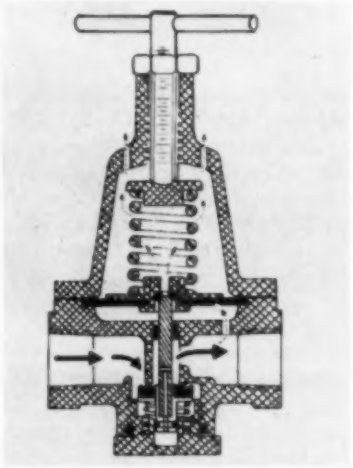
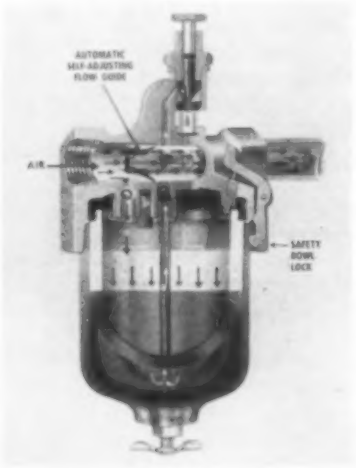


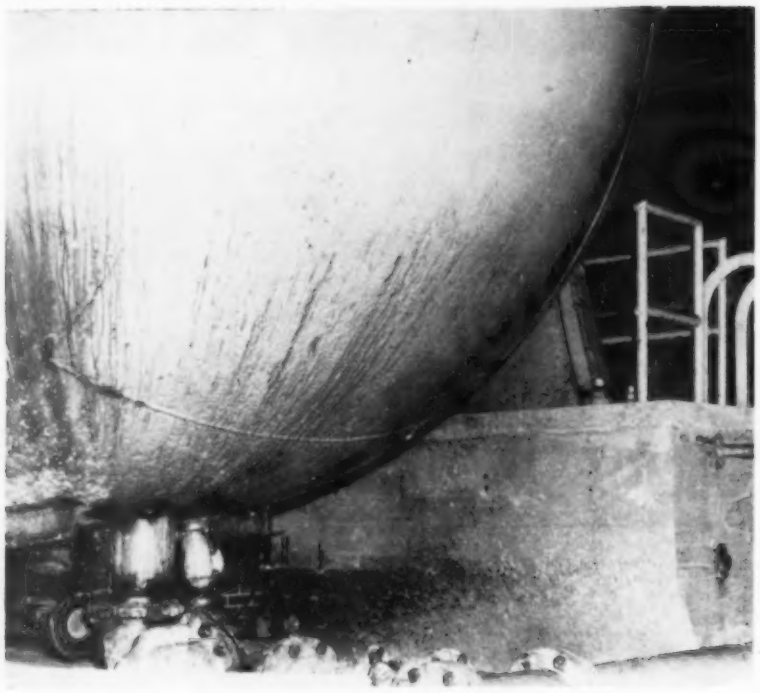
Illustration of float-operated automatic draining compressed air filter showing the two stages of air separation and filtration.

Typical compressed air lubricator showing travel of air and oil. The oil is forced up through the center tube by air pressure on top of it inside the bowl. The oil travels up to the top of the lubricator, then down through a needle valve metering device. The air traveling through the throat of the lubricator hits the oil droplets, atomizing them and carrying them on into the pneumatic equipment.



A typical compressed air regulator illustrating the self-relieving feature. Spring exerts a force on top of diaphragm opposing force of air pressure below the diaphragm. When air is used, the pressure is relieved from below the diaphragm causing spring pressure to be stronger. This pressure difference forces down on stem to open the main control valve. When air pressure under diaphragm builds up to equal the spring pressure, it allows the small spring under the main valve to close off air flow. If the pressure continues to build up under diaphragm for any reason, it will raise the diaghragm, thus raising the valve seat off the top of the stem, venting the excess pressure to atmosphere.





Upper portion of picture shows surface of sphere after chemical stains were washed off with water. Paint film needs no attention. Rough spots show pitting that took place prior to painting with epoxy five years ago.

Five-Year Report from North Carolina Paper Mill

EPOXY RESIN COATINGS

By TED CAMPBELL, A.I.P.E.

Construction Supervisor
Ecusta Paper Division
Olin Mathieson Chemical Corp.
Pisgah Forest, North Carolina

THE FIFTH YEAR of service for Epoxy Resin* Coatings has been reached at the Ecusta Paper Division of the Olin Mathieson Chemical Corp., Pisgah Forest, N. C. An earlier report on these coatings appeared in the April 1958 edition of Southern Power and Industry. The following report and pictures show how the coatings have served and how much reconditioning of the surfaces has been necessary.

Since the coatings were applied in 1955-1956 they have been gone over for touch-up twice. Once in the winter of 1958 and again in the winter of 1960. It is worth noting that no touch-up was required in 1957 and 1959.

In the previous article we stated that our goal was to restore the Pulp Mill section of the plant, to protect it from rust and corrosion, and to maintain it at an economical cost per year. By and large we have attained our goal even though we do not claim one hundred per cent success.

Touch-up painting due to the paint film being damaged in the course of mechanical repairs or installations has not been taken into account in appraising the effectiveness of the epoxy coatings. It is a constant factor regardless of the type of coating used. However it is included in the unit cost for touching up.

Where touching up was required it was largely the result of rust coming through the coating from the underside. This clearly indicates that despite our best efforts to remove all rust by sandblasting and acid treating we did not get it all.

Our conclusion is that the rust particles remaining on the metal surfaces continued their growth until the coating was pushed loose. This breaking through of the coating was not evident until the winter of 1960.

It is unfortunate that this rust action occurred in nooks and crannies beyond the reach of available photographic equipment and no pictures were obtained.

This lifting of the coating also occurred on numerous bolt heads and nuts as shown in picture No. 2.

During the last touch-up program all visible rust was removed by sandblasting and a prime and two finish coats of paint applied.

The background of picture No. 4 shows a section of vertical pipe with the finish coating flaking off and exposing the prime coat. The finish coat has separated from the prime coat in rather large flakes which appear sound and show no evidence of disintegration.

It appears that the first finish coat failed to bond to the prime coat, although the first and second finish coats bonded together. This is the only instance of a failure of this nature and the causes are unknown at this time.

So far the cost of maintaining this paint job has amounted to $0.135 per square foot of floor space, this sum being the total of

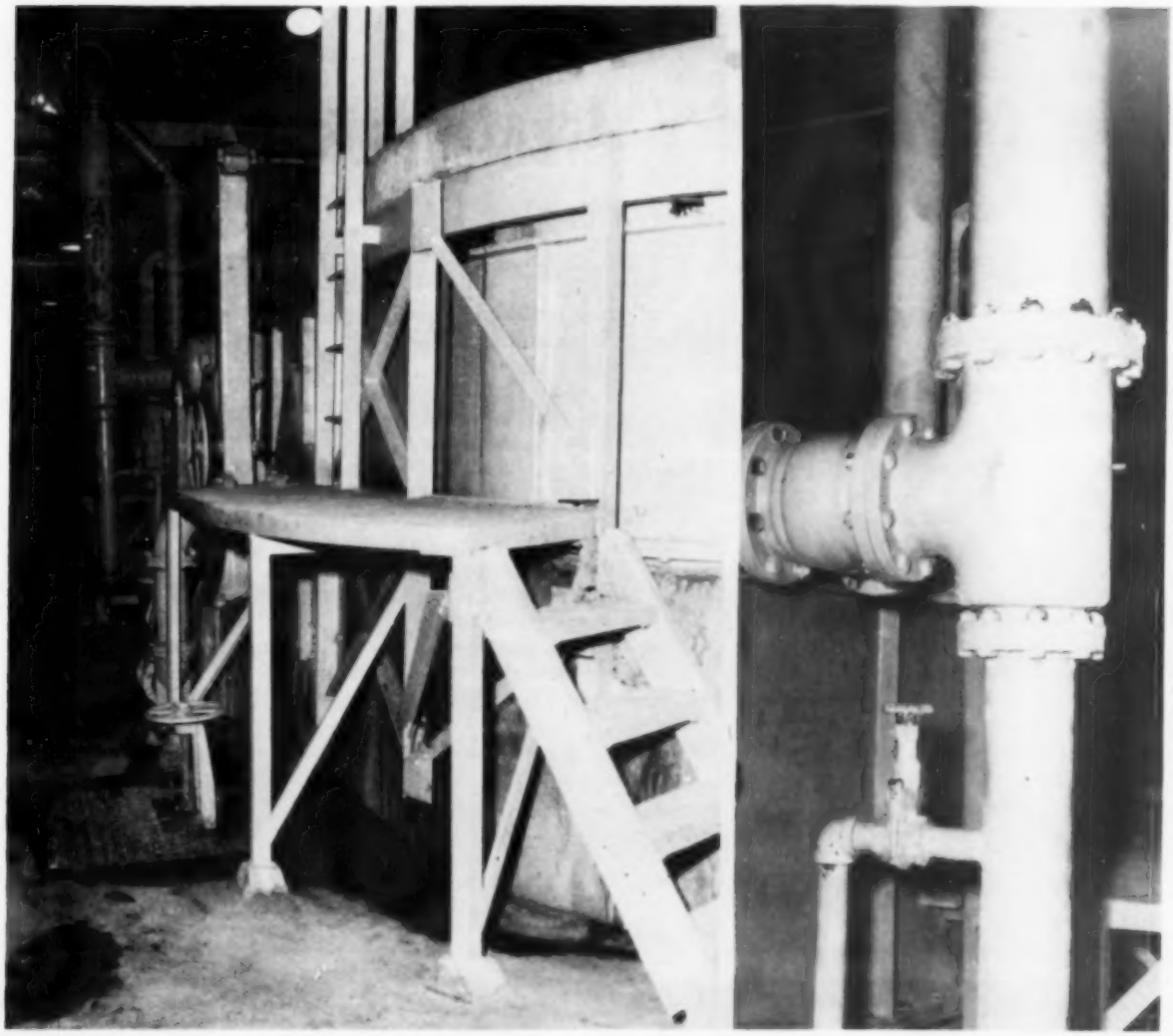
*Epoxy Resin paints were supplied by the Porter Paint Company, Louisville, Ky., and the Gilman Paint Company, Chattanooga, Tenn.

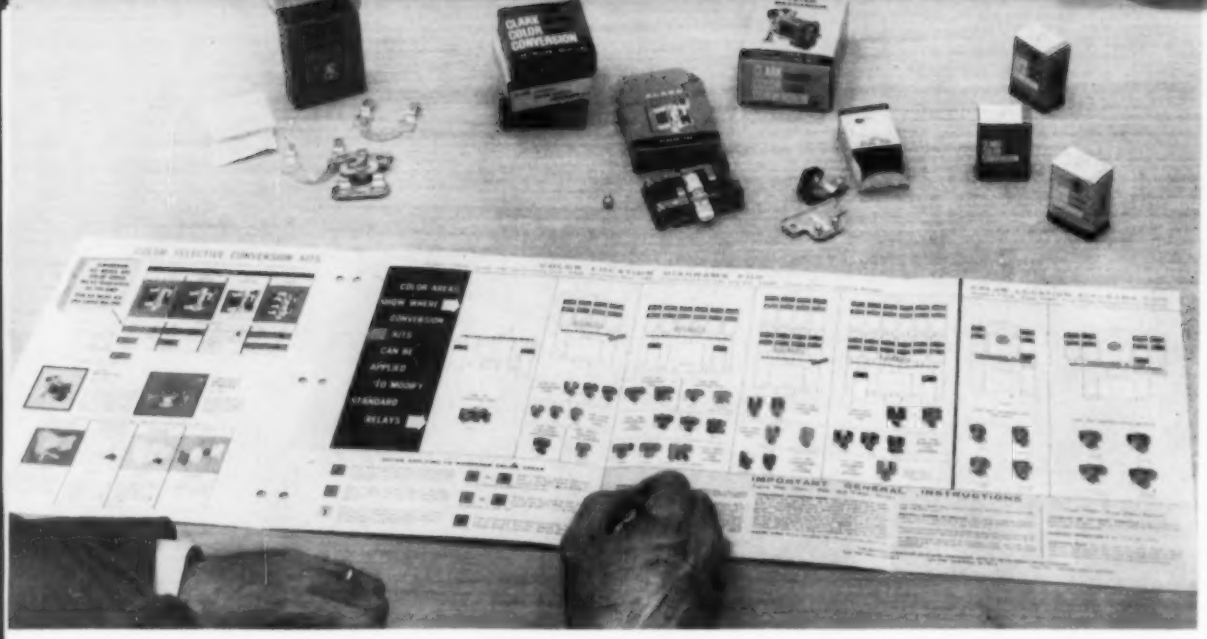
$0.04 spent in 1958 and $0.095 spent in 1960 for labor, materials and overhead.

For the five-year period, since the original painting was done, our maintenance cost per year comes out at $0.027 per square foot of floor space. This seems reasonable enough, but as to how long this rate will continue only time can tell.

Showing structural steel after washing with water. Dark stains are caused by condensate collecting between time of washing and time picture was taken. Paint has been in service about five years.

The picture below shows a beater that has been washed. In the background is the same piping shown in picture at right. Flaking paint on pipe bolts will be removed and replaced.




CLARK COLOR CONVERSION
COLOR AREAS SHOW WHERE CONVERSION KITS CAN BE APPLIED TO MODIFY STANDARD RELAYS
IMPORTANT GENERAL INSTRUCTIONS

Color-coded boxes and ten representative Color-Selective Conversion Kits

Relay Conversion Kits Make Maintenance Easier

DEVELOPMENT of a system of Color-Selective Relay Conversion Kits has helped solve an expensive, time-consuming maintenance problem.

The new system is based on 30 color-coded relay kits and a special engineering-data chart. With this system, users can modify standard relay types in the Clark "PM" line to meet almost any switching-circuit control requirement.

The chart, printed in colors that match the basic kit-box colors, shows maintenance engineers exactly how the units can be applied to modify standard relays. Color-location diagrams clearly indicate where the kits may be applied in various basic relay designs.

Advantages of the system include:

1—All relay types are "in stock" for control panel assembly, eliminating delivery delays.

2—Rapid changes can be made in relay switching circuits in existing installations.

3—Emergency replacements can be made in a hurry, minimizing production downtime.

Any inventory takes space and costs money. Now, with a modest number of standard types in the "PM" line, any needed relay is "in stock," by modifying standard units with the new color-coded kits.

To assure positive relay operation with maximum life, the strength of a magnet coil must match the mechanical load on the magnet. The Color-Selective Conversion Kit system results in an almost unlimited number of relay assemblies with varying magnet loads.

Because of the above flexibility, Clark devised a unique coil application system that enables users to readily select the proper coil for optimum operation of any particular relay. A section of the special chart includes complete magnet-coil application data.

Thirty basic conversion kits are available. Four of the selective-colors used (red, blue, yellow, and green) are assigned to boxes for relay pole kits. Within this group, 24 pole kits are available with contact types for virtually any application.

A latch mechanisim kit is in an orange box, and brown is used for the horizontal mechanical interlock. Kits for modifying time-delay relays are packaged in purple, pink, tan, and gray.

With the color-selective kits and the information chart, relays can be modified quickly to meet virtually any circuit requirement in a control panel assembly. If an emergency replacement of an existing relay is needed, it can be made-up in a hurry by modifying a standard relay.

Courtesy
Engineering Department
The Clark Controller Company

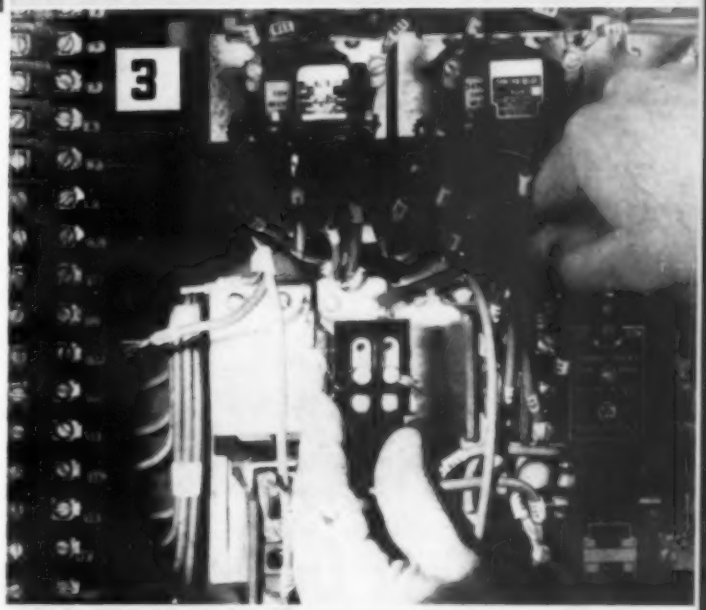
Fig. 1 — ORIGINAL RELAY: This relay with eight convertible poles needed to be changed to a latch type. Also, one set of contacts required a pole with noble-metal contacts.

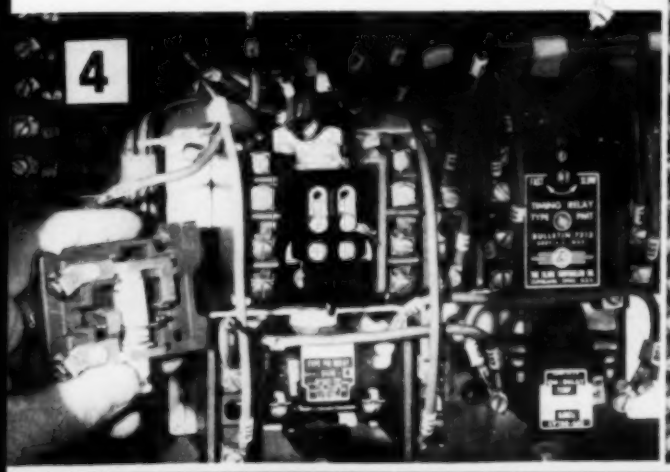
Fig. 2 — REMOVING CONVERTIBLE POLES: Five of the six convertible poles above the magnet are replaced with four Conversion Kits to meet new requirements.

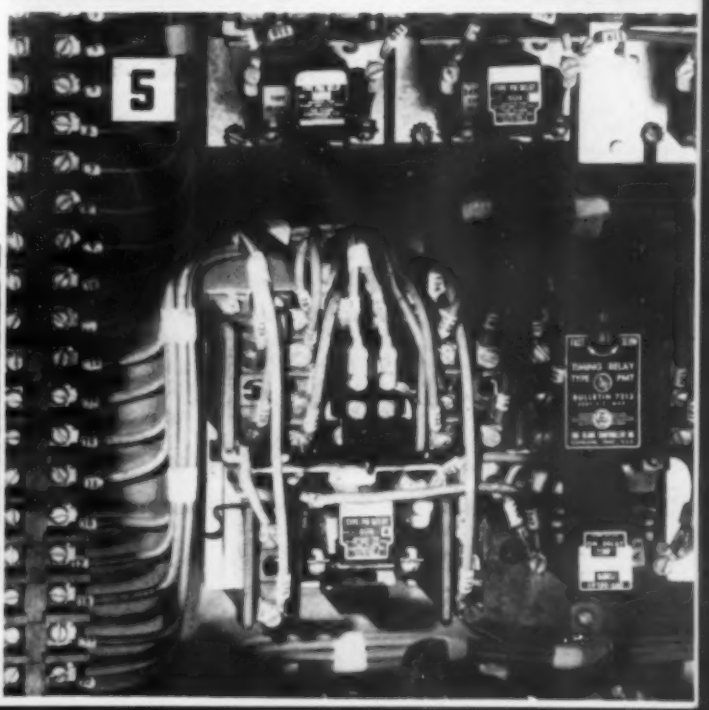
Fig. 3 — ADDING LATCH MECHANISM: Information chart shows where to mount the latch mechanism.

Fig. 4 — REPLACING POLES: Four convertible poles are replaced with two universal poles on either side of the latch mechanism.

Fig. 5 — MODIFIED RELAY: Existing wiring is connected to terminals on the new poles and two new wires are added to operate the latch-mechanism coil.







Air view of the Royal Portable Typewriter Plant at Springfield, Mo.

By **JOHN M. CONNELLY***

Plant Engineer, Royal Portable Typewriter Plant
Royal McBee Corp., Springfield, Missouri

THE AUTHOR is no stranger to maintenance and operation. He received his B.S. from the United States Merchant Marine Academy and is licensed as Chief Engineer of Steam Vessels of Any Horsepower, and by the City of New York as Power Plant and Refrigeration Engineer.

He was employed as engineer by Rockefeller Center Inc., and as Assistant to the Chief Engineer of Garment Center Capital in New York prior to joining Royal McBee some eight years ago. Before he was appointed Plant Engineer of the Royal Portable Typewriter Plant, he was Equipment and Utilities Engineer at Royal McBee's Hartford, Conn., plant.

The Plant Engineer's Responsibility for BUILDING DESIGN AND CONSTRUCTION

PLANT ENGINEERING is the master plan that integrates buildings and grounds, work centers, production equipment, manufacturing methods, material handling, production flow, utilization of labor, and service facilities into a coordinated production unit.

PLANT ENGINEERING must be included in the planning of any new plant at the very beginning. No one is more qualified to guide new plant planning than the plant engineer. No one is more concerned with the plant design and construction.

Economical operation of any plant begins with site selection. Labor, markets, raw materials, transportation, housing and proximity to suppliers and subcontractors are a few of the factors which must be considered in locating a new plant.

Equally important are those factors that directly influence efficient operation of the plant itself. Utilities — Are they available? Are they reasonable in cost? Does the city have an ample supply? For example, when the new plant's water pressure booster pump cuts in, will a pressure drop be noticed by every water consumer in a five mile radius? This has happened.

Zoning — Will noise cause your neighbors to involve you in litigation? Will noise isolation and suppression equipment be a costly afterthought? Is air pollution a problem?

What about local codes? Can local inspections and permit pro-

*Mr. Connelly's comments presented here are abstracted from his paper presented at the 12th Plant Maintenance and Engineering Conference, held concurrently with the 12th Plant Maintenance and Engineering Show, Jan. 23, 1961.

cedures be an annoyance later?

What about waste disposal? These are all problems the plant engineer will have to live with and he should be on the spot before they actually become problems. One plant found itself in a "pocket" that required pumping-out all sewage and waste water.

Maintenance Planning

Maintenance and repair costs represent a substantial portion of the profit dollar. Every effort should be made to *build maintenance out* of the new plant right from the start. The plant engineer must work closely with the architect to accomplish this.

The cost of permanent curtain walls and other permanent building features is something that can be amortized over the years. The cost of maintaining such items should be carefully considered and be shown on the spread sheet when decisions are made on what type of design is to become a permanent part of the plant.

Initial cost should never be the sole consideration for making a purchase decision. Every factor in new plant construction should be looked at objectively. Low-maintenance features are usually high in initial cost. The problem is to weigh such items in the light of the year-in and year-out savings they can produce.

It certainly is not true that the most expensive is the best. But it does hold true that the best is the least expensive. As the cost of maintenance labor and materials continues to rise, the modern plant engineer can easily see how extra investment in quality can produce long-term dividends.

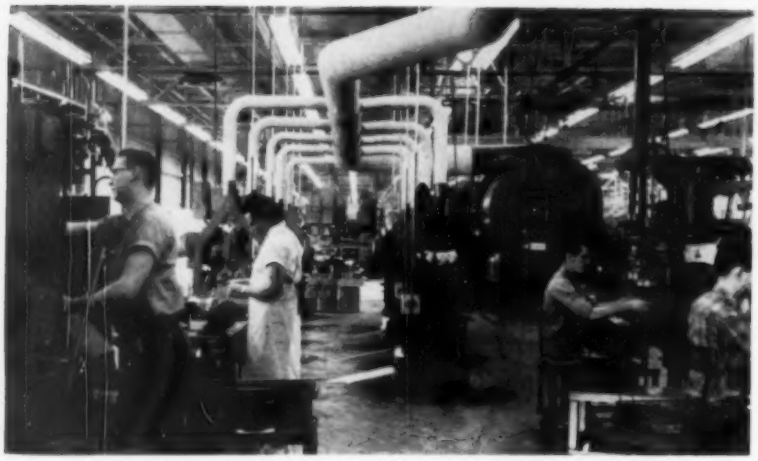
Work With Architect

Very few plant engineering departments are staffed to handle the design and construction of a new facility. Such a venture deserves full-time, high-level, effort. Selection of an architect to perform this service is a prime example of how money invested in quality is money well spent.

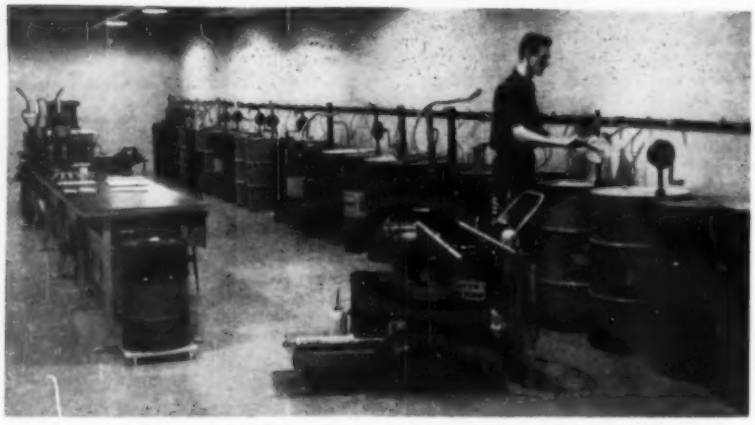
The plant engineer and the architect will work very closely on the project. The architect will be in a position to submit preliminary proposals in regard to building particulars, based on wide experience in designing similar plants. The plant engineer can submit alternate proposals based on his intimate knowledge of the particular plant's needs, and he will be in a position to discuss details and make recommendations with supporting information that can influence decisions. Together they can team broad industrial knowl-

These, and many other elements of plant design ultimately affect maintenance.

- Relocations, additions, and moves of every description must be provided for in the basic layout of the modern plant.
- Time spent in preparation of module templates is time saved when preliminary planning of departmental areas becomes a reality.
- Layout of the actual departments cannot start until materials flow intentions have been determined.
- In determining the size of work areas, each department must be completely surveyed from every angle.
- Selection of heating methods is of primary concern. Cost of fuels must be considered but of equal importance is the type of application and its location in the plant. Comfort heating methods hinge directly on building construction and productive processes.
- The trend toward adequate ventilation is not alone because of comfort but also the cleanliness that goes with filtration.
- Positive mechanical ventilation is a labor code requirement in some states.
- The benefits of air conditioning become obvious when it is seen how a warm day has no effect on a day's production and how employee morale is improved.
- Winter comfort heating load and process requirements are what industrial power plants are generally sized for. But with only a process load in warm weather, operation is intermittent and expensive.
- Year-round thermodynamic balance of the power plant is more possible with the steam operated refrigeration equipment.
- The question of central system vs individual package units is one that only the plant engineer can properly answer.
- A good, well diffused lighting system is an asset to any plant. It provides flexibility that makes facilities relocation easier.
- The time to avoid supplementary lighting and its associated problems and additional maintenance is in the planning stages.
- Lighting should not be designed for initial foot-candles but for the degree of illumination which will prevail with ordinary planned maintenance.
- Electric service planning today heavily leans toward load center distribution. Unit substations are located close to the loads so first cost can be lowered by use of less copper.
- Whether to have a guard force depends upon requirements of the individual plant. Let's take a hard look at pilferage, burglary, and sabotage. Each of these is the concern of every level of supervision.
- Combination fire alarm boxes and watchman stations can be recorded on a single tape. The heart of such equipment must be located where there is round-the-clock supervision.
- Close cooperation with insurance underwriters in regard to fire preventive features can result in lower insurance rates that easily justify the adoption of underwriters' recommendations.
- Safety must be built into a plant at the very start: exhausting explosive atmospheres . . . storage of flammable liquids . . . traffic and handling facilities. The list is almost endless.



Cast iron dust presents a serious maintenance problem. Well designed ductwork and an oil bath type air cleaner provide an effective dust collecting system.



The only painted floor in the entire plant is in the Oil Storage Room. This facilitates cleaning. Large drums are fitted with pneumatic delivery pumps, and all drums are grounded to the compressed air line.

edge with specific plant needs to get benefits of acceptable new developments without sacrificing proven design essentials.

Selection of an architect must not be done haphazardly. This is the first positive action toward the construction of a new plant. The first step in such a search is to observe completed projects of a similar nature. When a list of prospects has been compiled, they should be told of your intentions and each should be invited to meet with you and top management for discussions. When you meet with representatives from each architectural firm, you can determine what their experience has been, how the job would be handled, the time required to complete the plans, fee expected and other details. This information should then be listed and the less suitable firms eliminated.

The plant engineer and the architect will work hand in hand from the inception of the project until the day of Open House. The relationship does not end even there. It continues until all guarantees have expired and even beyond that.

Surveys, development of preliminary plans and specifications, preparation of bid drawings, selection of contractors, supervision and acceptance of construction work concern both the plant engineer, as the owner's representative, and the architect. It is a cooperative effort.

Plant Engineering must tell the architect what utility requirements are, what area is indicated, equipment preferences, production flow, office sizes, receiving and shipping facilities, etc. The architect will ask many pertinent questions and the plant engineer must be prepared to answer positively.

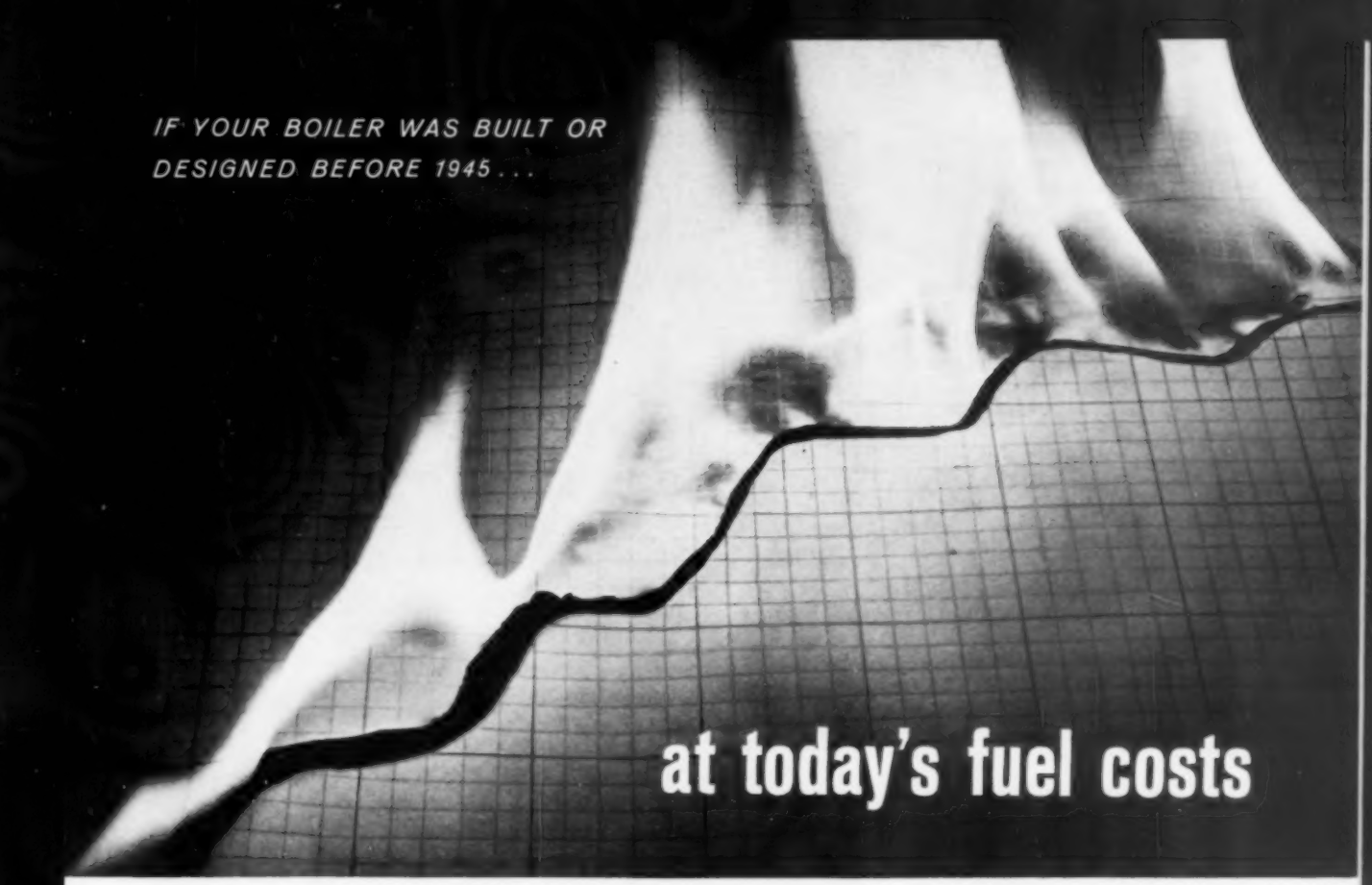
Close cooperation between the architect's project engineer and the plant engineer will bring the plans and specifications to swift completion. Throughout the planning stage the architect will submit estimates containing alternate prices depending upon final selection of materials. Most of the questions will be settled by Plant Engineering. Those items requiring large expenditures should be referred to top management with recommendations for decision.

While construction is underway plant engineering should be on hand to coordinate field activities with equipment installation intentions. Effective layout and close coordination of this type can be responsible for the saving of many thousands of dollars.

Management Responsibility

Engineering and maintenance have become more and more closely associated over the years. Excessive maintenance costs are often blamed on poor engineering. It therefore follows that economical maintenance begins with sound engineering.

A machine which has been designed to perform a certain operation is not an ideal machine merely because it satisfies its basic purpose. It cannot be refuted that for such a machine to be a wise investment Plant Engineering should be in on the ground floor for selection and application. Plant Engineering is in a position to give the utility requirements consistent with the proposed installation and location of the machine. This can guarantee that transformers, pressure reducing stations, etc., will not later be required at the installation. With Plant Engineering



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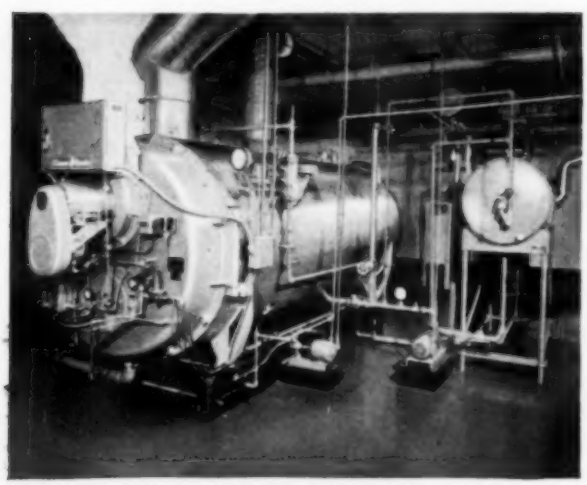
See your local Cleaver-Brooks agent for more detailed information, or write for the booklet, *How to Select a Boiler.*

GETTING MORE HEAT FOR THE FUEL DOLLAR

The W. T. Rawleigh Company, manufacturer of toiletries, medicines and food products for the home and farm, replaced two old firebox boilers in their Memphis, Tennessee, branch with one fully automatic, combination-fired CB boiler. Mr. James Trindle, office manager, reports: "Our records show . . . 36.4% less fuel consumed during winter months that averaged about 12% colder than the previous year. We're getting greater fuel economy than we expected."



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represented in the design stage, standardization of parts consistent with existing inventories is possible. The benefits to the company amount to dollars from every direction. Even the color of the machine is a Plant Engineering concern.

To assure as wise an installation as possible, Plant Engineering must be in on the basic planning. This is top management's responsibility to the stockholders.

Remember, Plant Engineering is the master plan that integrates buildings and grounds, work centers, production equipment, manufacturing methods, material handling, production flow, utilization of labor, and service facilities into a production unit.

Plant Engineering is the medium through which management objectives are translated, by accurate working diagrams and specifications, into accomplished fact.

Must Influence Decisions

The design and construction of any plant is a basic plant engineering function. Plant Engineering must be in a position to *influence* decisions because plant engineering will certainly be *influenced* by the decisions that are made. The new plant must be built with the economical operation and maintenance of the plant and its productive equipment and processes in mind. No architect can do this alone. The responsibility is properly the plant engineer's and it is he who will have to live with the conditions he helps to create.

Old-fashioned maintenance and plant engineering practices are a thing of the past. As automation and technological changes increase and become more complex plant engineering covers a wider scope and becomes more technical. The future will require plant engineers of higher status and with broader engineering knowledge than ever before.

Plant Engineering has been described as having to translate management objectives into the language of engineering and trade technicians. This is true, and the technical vocabulary has been increasing. Management's vocabulary has also been on the rise. The plant engineer now is required to speak the language of the accountant, salesman, lawyer, insurance man, financier, and executive as well as that of the engineer. One of the plant engineer's prime responsibilities is to translate engineering objectives to plant management.

To effectively present cost saving facts to management, complete analyses are required. Basic accounting principles should be utilized to reduce proposals to bare facts. An expenditure proposal should read very much like a financial statement when presented for management's consideration. Estimated costs must be clearly shown compared against estimated returns and factors such as depreciation, amortization, and maintenance costs must be included.

The plant engineer's responsibility for design and construction is only one facet of his overall responsibility to management. Setting up a new production facility demands the employment of the latest methods of evaluation. Economic studies of equipment, materials, and methods must be conducted in such a manner that justification for decision is presented as obvious fact.

Controlled maintenance, planned maintenance and preventive maintenance are terms we have been hearing for years. Where does maintenance control begin? It begins on the drawing board and in the new plant's specifications.

Note the pitched floors and drainage trenches. Piping and conduit are arranged to be clear of traveling hoist.

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Sound-Powered Phones Aid Safety in Alabama Steel Mill

Know What's Going on in the Danger Zone

TOP PRIORITY has been assigned to improving communication between work groups in blast furnace areas of Republic Steel Corporation.

The move was planned to increase efficiency of manufacturing operations and maintenance projects, and to improve safety controls affecting both.

In addition to extensive standard telephonic communication, Republic utilizes sound-powered wire units that maintain direct voice contact with workers in remote or closed spaces where toxic hazards may exist. This sound-powered communication has proved particularly effective in areas where conventional telephones are impractical, either because of working conditions or because of infrequent use.

One of the first Republic Steel mills to supplement its standard telephone network with the sound-powered wire units — or Maskfones — was the Gadsden, Alabama, plant in the Southern Steel District.

This occurred early in 1959 when E. L. Jones, blast furnace superintendent, suggested to M. C. Cunningham, safety supervisor, that "information be obtained on a suitable communication system for use between work groups in blast furnace areas where regular telephones are not available."

Shortly after, tests were made, and the Maskfones were put into immediate use. In fact, a number of the sound-powered systems, supplied by Mine Safety Appliances Company, are in use at the Gadsden plant, and several are being employed at other Republic Steel plants.

Safety Supervisor Cunningham said the self-contained units are being used in gaseous areas at Gadsden to carry on two-way voice communication with watchers assigned to jobs where vision is obscured for any reason. He also commented that the equipment is employed for point-to-point communication around blast furnaces, where it is also necessary to use breathing apparatus.

He said the Maskfone has proved an effective method of secondary communication from furnace top to cast shed or ground in rare instances when permanent telephones became useless during repair projects. "In fact," he said, "it was this particular activity that prompted the request for a 250-foot long cable with the units, instead of the standard 125-foot reel."

He said the sound-powered phones have considerable value where work is in progress on furnace elevations and no other method of communication is available. Typical examples are the repair or operation of goggle valves under conditions where gas is present.

Also, the units have proved valuable in maintenance of large gas mains where crews are often out of visual communication. Without the sound-powered wire systems, these operations alone would require use of several watchers to maintain adequate safety precaution for working groups.

A sound-powered system is employed for point-to-point communication around gaseous blast furnace areas at Republic Steel. The workers are equipped with masks and breathing apparatus.

YARWAY news briefs

from **Yarnall-Waring Company,** *Philadelphia 18, Pa.*

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HOW TO GET REMOTE LIQUID LEVEL READINGS YOU CAN DEPEND ON

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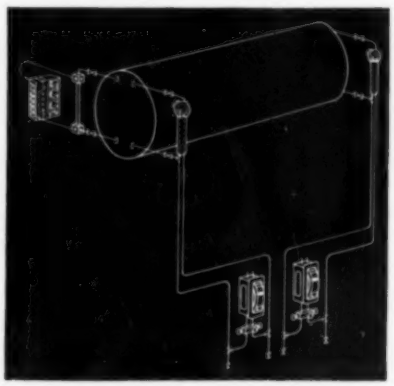
ACCURATE—because the indicator is operated by the boiler water (or other liquid) itself. The varying head instantly actuates the operating mechanism, yet the pointer mechanism *is never under pressure.*

BRILLIANTLY VISIBLE—because the brightly-illuminated, wide-vision dial can be read at a glance from multiple vantage points, including any place in a 180° arc.

Through use of a Control Unit, additional remote horn or light signal alarms may be operated from a Yarway Indicator.

Get the full story on Yarway Indicators in Bulletin RI-1825—including 17 typical installation hook-ups. Write for your copy today.



YARWAY INDICATORS ARE FULLY APPROVED AS PRIMARY INDICATING ELEMENTS UNDER BOILER CODE CASE #1155

Under A. S. M. E. Boiler Code Committee ruling in Case #1155, two independent remote level indicators of compensated manometric type may be used instead of one of two required gage glasses for boiler pressures 900 psi and above. When both indicators are in operation, the gage glass may be shut off but shall be maintained in serviceable condition.

Yarway Remote Liquid Level Indicators conform to and are widely used under this ruling.

If you would like a copy of this Boiler Code ruling, just write and ask for Case #1155 reprint.

Looking down into the manhole. The fluorescent lamp enters the sewer line and tows the TV camera behind it for a visual inspection. TV picture is transmitted to a receiver in a truck on the street.

By **HARRY J. MILLER**
Sarasota, Florida

Florida Engineers Find Shortcut for Sewer Maintenance

TV Goes Underground

A TELEVISION camera that works underground has saved taxpayers in Hollywood, Florida, close to a quarter-million dollars in sewer repairs. It squelched infiltration of more than 4,000,000 gallons of water that robbed sanitary sewer capacity by half. St. Petersburg also is starting a search of its $20,000,000 sewer system that will turn up photographic proof of installation defects.

By this video-photographic technique, many of the expensive vexations of conventional sewer maintenance are avoided. It is no longer necessary to detour and snarl traffic, break up existing streets and roadways or excavate, dewater, backfill and repave.

The TV camera, only 5 inches in diameter and 18 inches long, is lowered into a manhole, preceded by a 40-watt fluorescent lamp. Lamp and camera are towed through the sewer line to the next manhole to locate leaks and defects. The camera transmits its view of the interior of the sewer to the screen of a monitoring television set in a truck on the ground. It pinpoints the location of the leak. Then a 1½-inch pipe is jetted down from the street and a void is blown around the pipe. The void is then filled with a special cement grout from a concrete-batching machine carried on another truck.

City engineers watch the screen as the TV camera picks up the leak, and as the leak is stopped on the spot.

In the case of St. Petersburg, which seeks evidence to justify negligence by contractors, a preliminary survey is made and every defect turning up on the television screen is photographed by a Polaroid camera.

Before a recent $900 trial of the TV inspection method, St. Petersburg had expected to make actual sewer repairs itself. However, the first TV probe of a trunk line was so successful that within a few days, $10,000 more was appropriated for a more comprehensive survey aimed at getting major defects corrected much sooner than originally anticipated. City Manager George K. Armes and other city officials have estimated the local sanitary sewer system needs about $1,500,000 worth of repairs.

"Our cost so far for sealing leaks in our sewer lines has been under

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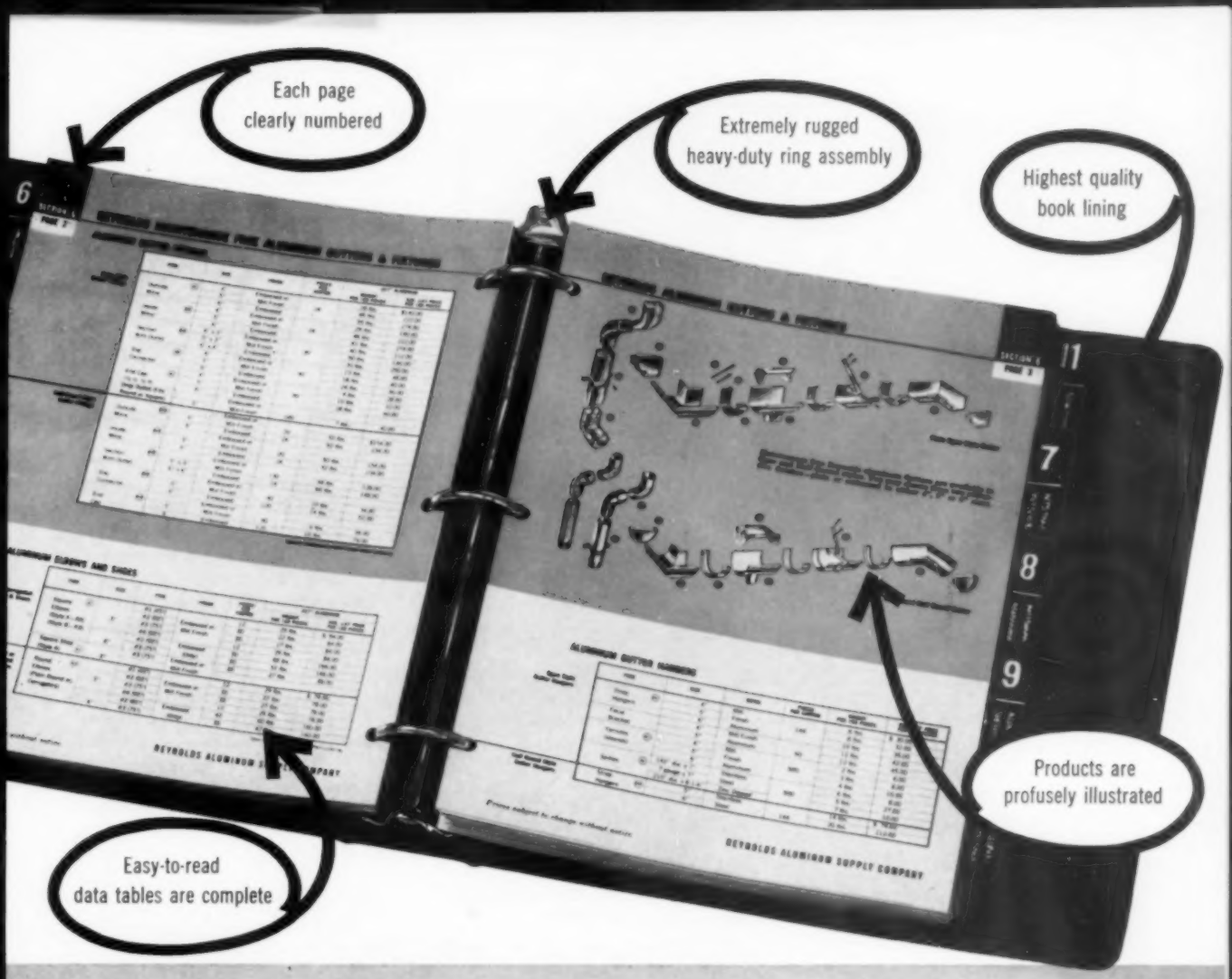
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MEMPHIS, TENN. 703 North Royal Ave. JA 5-4717	**MIAMI, FLA.** 3690 N. W. 52nd St. NE 5-0647	**RALEIGH, N. C.** 1431 Courtland Dr. TE 4-6221	**RICHMOND, VA.** 1910 Petersburg Pike BE 3-9693	**SAVANNAH, GA.** 309 Stiles Ave. AD 6-2461	**NASHVILLE, TENN.** 700 Harrison Street AL 5-1152

Communication with work crews is by 2-way intercom and sound-powered telephone. The operator at the TV receiver in the truck issues instructions.

The larger truck (background) carries a concrete-batching machine to provide a special mix for plugging the leaks.

A permanent photographic record makes an unanswerable argument in court. Use of a Polaroid camera avoids hazard of poor developing and printing that might exist with ordinary photography.

$35,000 with this system," said Joseph W. Watson, City Manager of Hollywood. "If we had been forced to tear up streets to do it, it might have cost as much as $250,-000!"

Inspection of the repaired leaks in Hollywood more than 18 months later revealed no failures.

Because of Florida's water table, appearance of leaks in sewer lines is immediately evidenced by the entrance of water into them. This taxes pumping and treatment equipment capacity.

Aside from the fact that the video - inspection - repair method costs only from 10 to 20 per cent as much as conventional repairs, Don Jones, Director of the Sewer and Water Department of North Miami points out another advantage: "We find one thing sure in repairing leaks in our sewer collection system—excavating around sewer lines to repair leaks has not proved satisfactory. When a leak is repaired in this fashion and backfilled, there will be more settling in the portion of the line that was excavated than in the remainder that was not so disturbed. Consequently, in a short period of time, the leak that was repaired by excavation will continue to leak through the section where the ditch was opened.

"This is why we have done a great deal of experimenting with a method suitable for repairing infiltration without excavating or seriously disturbing the ground in the vicinity of the line.

"Some engineers have ventured opinion that this concrete-plugging of the leaks is impractical because hydrogen sulphide gases attack the concrete. This is true, except in dense concrete. Some engineers now approve dense cement brick for manhole purposes, whereas a few years ago, the only type of brick approved for sewer manholes was baked clay."

Over 400 leaks have been repaired for the City of North Miami by Arthur Douse, owner of the video-photographic leak detection system, cutting the flow at the disposal plant from 8,500,000 gallons to 4,500,000 gallons, which is close to actual sewage.

Other Florida cities are investigating the new technique, and it is sparking interest nationally.

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For more information, Use Reply Card—Page 85

A standard time clock with time cards is a unique method of providing accurate, fool-proof records on batteries in a Kraft Food Company plant.

EIGHTEEN RULES FOR INCREASING BATTERY LIFE

By ROBERT HOPEWELL
Manager Field Engineering
Gould-National Batteries, Inc.

COSTS ARE REDUCED when battery life is extended. The difference in cost between four years of battery life and six or more is considerable. Here are eighteen rules that will help increase battery life.

1. Select Adequate Capacity

Batteries for industrial trucks should be specified according to the capacity recommendations of the manufacturer of the equipment to be served. Experience gained from previous use of similar equipment will also help in determining the correct size. Substituting a smaller battery almost always results in overdischarging the battery and lowers efficiency.

A sufficient number of spare batteries also is important. As a guide, 2.1 batteries per truck is the minimum required for three-shift operation, provided available charging equipment can recharge each battery in eight hours.

2. Assign Responsibility and Authority

Put one man in complete charge of battery operations to centralize authority and responsibility. He should be well-versed in battery technology and understand charging and maintenance procedures.

3. Inspect on Schedule

To keep batteries at maximum efficiency, establish a maintenance and inspection schedule. A check list should be employed to assure that inspection is complete.

4. Keep Records

Records of charging and maintenance operations show which batteries are being abused, and make it possible to take steps to correct abuses or replace units in time to prevent production stoppages. From these records troubles in operating equipment, charging equipment, and charging schedules often can be diagnosed.

5. Avoid Overdischarge

A battery must not be overdischarged, if maximum life is to be attained. Although occasional overdischarge has no harmful effects, if continued, the plates will be damaged and battery life will be shortened.

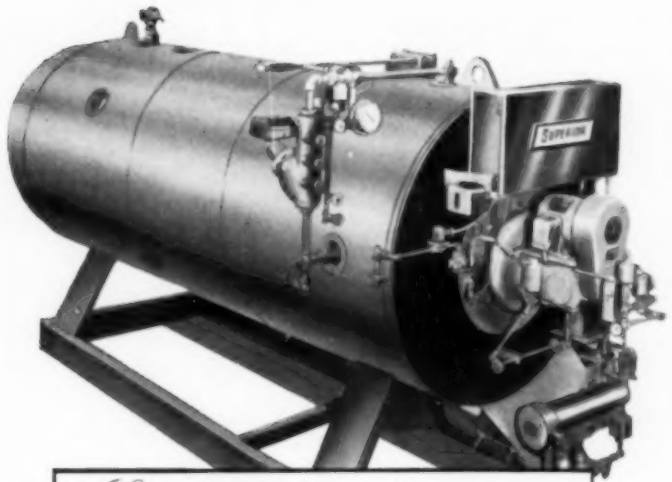
6. Do Not Overcharge

A battery should not be overcharged because this results in gassing, overheating and loss of water from the electrolyte. Constant overcharging will permanently damage some of the elements.

7. Give Boost Charges

Boost charges occasionally are necessary when trucks are doing

Don't settle for less than SUPERIOR®



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The tests of a prototype won't prove the performance of YOUR unit . . . and factory-fire-testing "gets the bugs out" at the factory . . . not in your boiler room.

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extra-heavy work, or working extra hours. To prevent overdischarge, a brief charge is given during a lull in the work cycle.

8. Schedule Equalizing Charge

An equalizing charge should be given at least once a month, but not more often than once a week. This is an additional charge of three or four hours at the finishing rate of the battery to bring each cell up to full charge.

9. Locate Stations Carefully

Considerable savings can be made in plant operation if charging stations are placed strategically. In large plants, it may be advantageous to locate small charging stations in outlying departments.

If a large central charging station is installed, it should be situated so that all trucks travel approximately equal distances for charging. Central charging has the advantage that supervision is easier. In some plants charged batteries are delivered by a trailer to the trucks in their work area.

10. Maintain Schedules

By assigning each truck in the fleet a specific time to report for charging, a backlog will not pile up at the charging room and truck downtime will be minimized. Each battery will receive proper attention.

11. Control Charging

Although charging equipment today is largely automatic, it must be correctly set for the size of battery charged. If a voltage relay timer governs the charging period, it should be kept in good operating order.

If the ampere-hour method of controlling is used, charging men must be thoroughly familiar with ampere-hour-meter charts and ultilize them correctly.

12. Inspect Meters

An occasional check-up of charging equipment, ammeters and voltmeters should be made. Although serious inaccuracies will show up during charging, small errors can go unnoticed and lead to less efficient charging and reduce battery life.

13. Charge Idle Batteries

Batteries that are stored should be given a freshening charge once every three months. If this is not done, the battery eventually will discharge itself and a lead sulphate film will form on the plates. If allowed to remain, the film will harden and impair efficiency of the battery when it is put in use.

14. Make Repairs Promptly

When inspection reveals a damaged cell, repairs should be made immediately, both to prevent further damage and to bring the battery back to maximum efficiency.

The battery room foreman should be familiar with repair techniques. A small supply of spare parts, such as jars, covers, and connectors, should be kept on hand together with the proper instruments and tools.

15. Replace Old Batteries

Efficiency drops rapidly after a battery starts delivering less than 85 per cent of its rated capacity. When this point has been reached, the battery should be replaced.

16. Provide Proper Equipment

In addition to a small office for records, the battery room should have means of moving batteries to and from chargers. A set of standard and special tools and instruments for making battery adjustments and repairs should be available. Spare parts to get damaged cells back into service quickly will usually pay off. Water and compressed air for cleaning are useful. A source of distilled water, if local water is not usable, is a must. Sulphuric acid for storage battery use is essential.

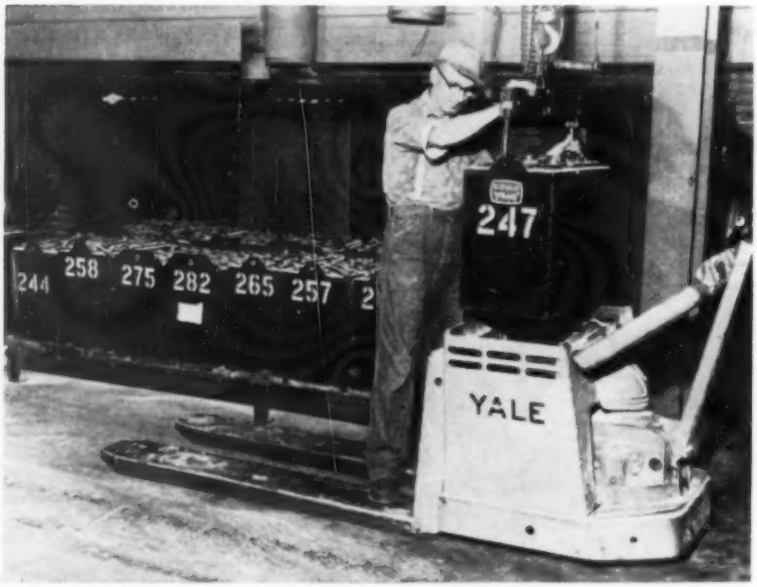
17. Use Spreader Bars

Batteries should be lifted by spreader bars so that the lifting force on the battery box is vertical. The use of slings will bend the battery box.

18. Enclose Charging Area

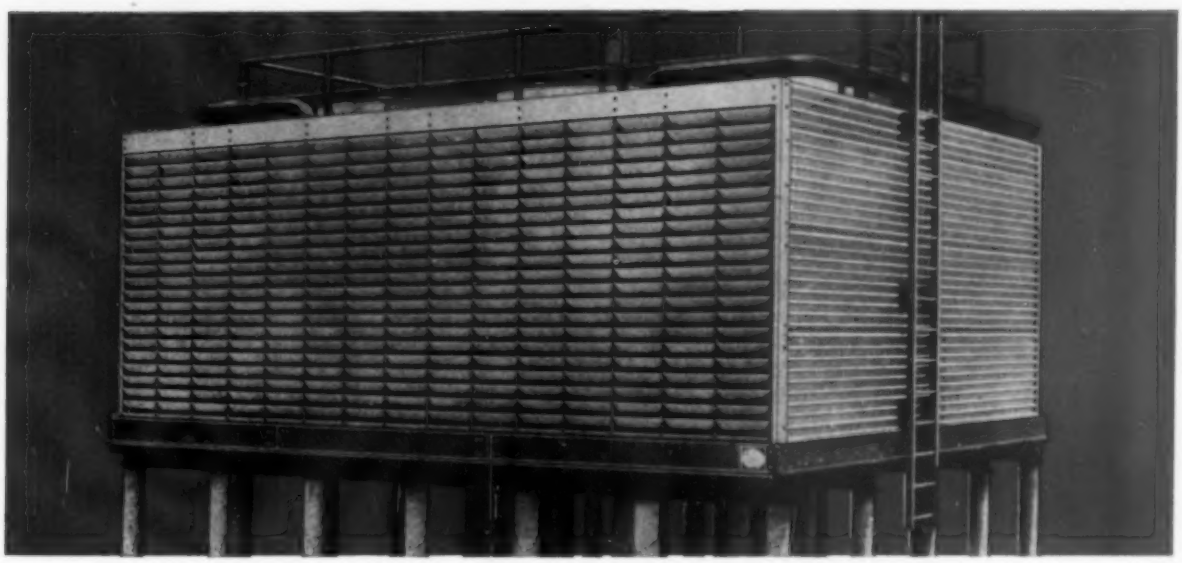
Battery charging equipment should be protected from accidental damage by trucks by a railing, concrete curb, or other means. If possible, the charging area should be completely enclosed with a heavy wire grill to prevent unauthorized personnel from tampering with batteries or charging equipment. And of course the room must be adequately ventilated.

This spreader bar of local design uses steel hooks and lifting eye bolted to wooden cross bar to prevent short circuits. One hook is fixed, the other is movable. Note, also, that each battery is numbered.



anco water treatment

ELIMINATES SLIME, SCALE BARRIERS



for economical cooling operations

THE WALL OF SLIME . . . scale . . . rust . . . built up in pipes and intricate tubes of your refrigeration and air condition systems cuts proper heat transfer, produces high head pressures, retards circulation, causes equipment overload, and brings on expensive shutdowns eventually. The longer hours of operation during the summer mean added load on your cooling equipment, so avoid trouble by getting rid of this slime-scale barrier now.

FOR EVERY WATER TREATMENT PROBLEM, Anco has a specially formulated product to correct it quickly without halting equipment operation. From there on out, with an Anco-designed program of continual control, you can keep your refrigeration and air conditioning systems *deposit-free.*

ANCO SCALE REMOVER . . . a sulfamic acid-based formula in safe, dry form . . . removes scale quickly from condenser tubes of all types . . . reduces high head pressure, restores economical operation, adds service life to equipment.

COOLEX and **SR-2** are inexpensive, effective formulas to protect all contacted surfaces against rust, pitting, scaling, and delignification. Maximum efficiency of operation is assured, with a minimum expenditure for upkeep.

ANCO ALGAECIDE kills and removes algae and slime from your cooling water system. This highly effective chemical does the job while your equipment is operating.

Expert Anco service representatives throughout the South offer you a free analysis of your water problems. Let an Anco representative outline for you the advantages of installing this treatment program in your plant now. Write today for details about Anco services. There is no obligation.

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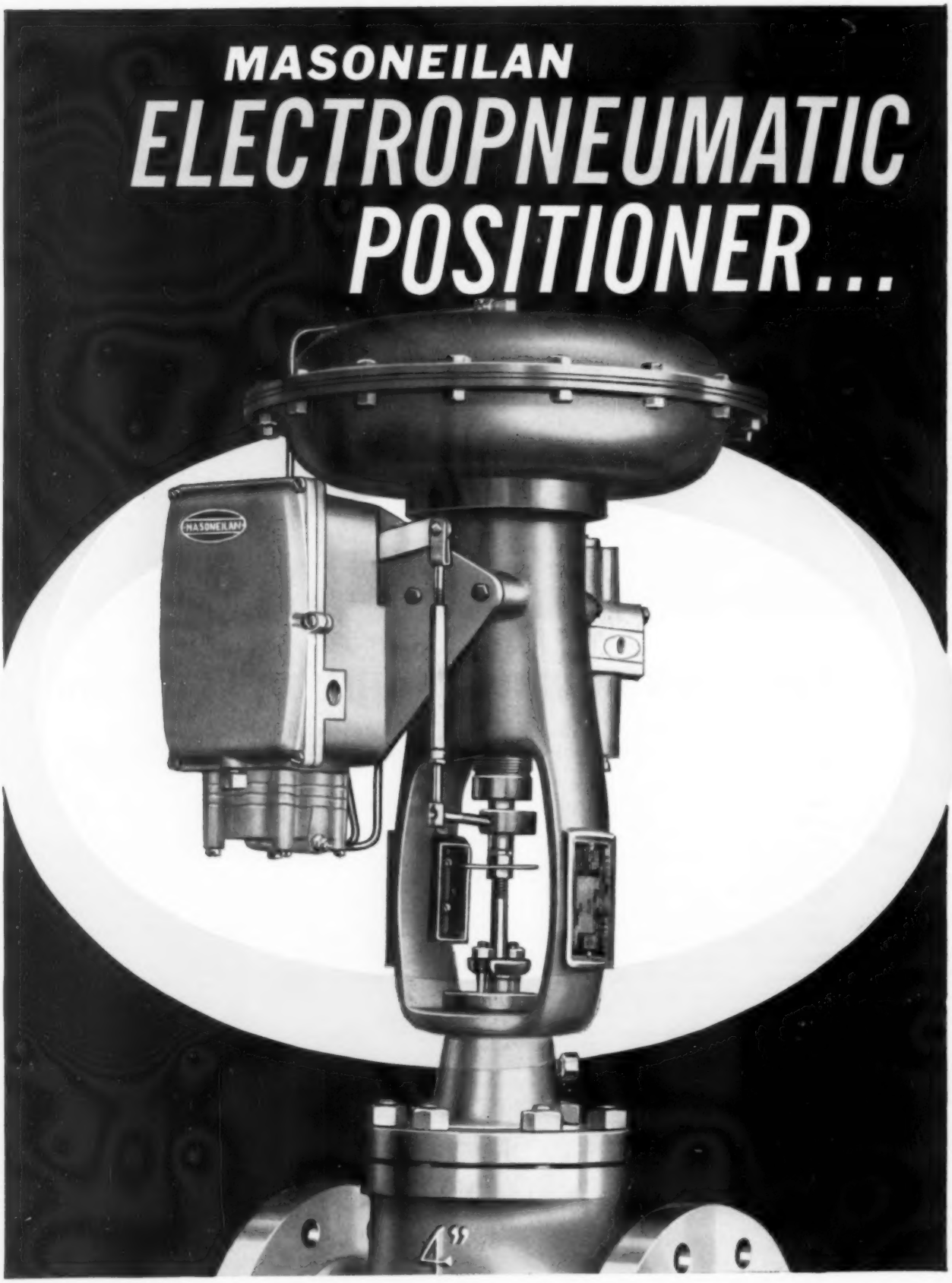

Arranges Happy Marriage

Between Electronic Controller and Pneumatic Control Valve

The advantages of the electronic controller can now be mated to the superior power and smooth throttling action of the pneumatic control valve by means of Masoneilan Model 8010 Electro-pneumatic Positioner — the most advanced device available for converting electric output signal to pneumatic positioner output.

Fidelity of positioning is assured because Model 8010 is a true positioner providing *direct* comparison of valve stem position with controller output signal, resulting in dynamic response and accuracy *not possible with any combination of transducer and positioner.*

Compatibility with any presently available electronic controller is obtainable because design provides for adaptability to all usual controller output signals.

Character of the design results in high open-loop gain and closed-loop stability. Balanced beam permits installation of the valve in any position without calibration shift.

You Are Invited to join the growing number of users who recognize the superior merits of Masoneilan Electropneumatic Positioners. The first step — obtain complete information. Get in touch with any Mason-Neilan office or representative; or write direct to

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DESIGN FEATURES

- Extra large stabilized magnet, plus efficient magnetic circuit, provides high-force changes.
- External stroke adjustment accessible without removal of cover — no exposure of electric wiring.
- High capacity relay for fast stroking speeds. Relay may be mounted in any one of four positions to facilitate piping.
- Balanced beam permits installation of valve in any position without shift in calibration.
- Available for 3-15 psi or 6-30 psi valve spring ranges and for split-ranging. Standard stroke ranges ⅜" – 3" and 2" – 4". Others available.
- Available with direct or reverse action and for direct or reverse actuators.
- Explosion-proof construction meets requirements of Class I, Division I, Group D.

PERFORMANCE DATA

Open-loop Gain* — approx. 100

Linearity—within ±1% of full stroke

Repeatability — within 0.2%

Load Sensitivity — output pressure change of 1.2 psi per 0.1% of full stroke offset

Supply Pressure Effect — ±1% of full stroke for ±5 psi change from 20 psi

*Defined as $\frac{\%\text{ of full stroke}}{\%\text{ of full input range}}$

For more information, Use Reply Card—Page 85

Many Piping Material Problems Can Be Solved By New Method

FIELD CORROSION TESTS

DESIGNED TO SATISFY needs of process engineers when specifying valves and other pipe line equipment for severe service in chemical, petroleum and food industries, a unique field testing service has been developed by research engineers of the Alloy Steel Products Company.

In usual practice, chemical and corrosion engineers specify the alloy at the time valves and related equipment are bought. And because corrosion factors were considered when specifying materials, service failures caused by accelerated corrosion are often mistakenly ascribed to faulty valve design or other purely mechanical factors.

In trying to solve this problem, it was obvious that specific data as to the set of conditions involved in each installation was a basic necessity. The trouble was that "approximate" data which is gathered from laboratory tests or from standard handbooks are often meaningless when compared with full scale operating conditions. Thus, a method was needed to gather the data at the actual site of the valve.

The problem was solved with the development of a special test rod (Fig. 1) which can be mounted in actual processing lines. Samples of many different alloys can be attached to the rod, and their relative resistance to the operating conditions can be studied. As shown in Fig. 2, the supporting ring at one end conforms to ASA standard dimensions for raised face pipe flanges. The assembly is held in place by bolting the ring, with a gasket on either side, between the mating flange faces. The rod produces only a minor pressure drop, and thus can be tolerated in almost any operating line.

These test rods are installed and exposed to the solution for a minimum of sixty days, or longer if feasible. When the test period is over, the rod assembly is removed and sent to the laboratories for evaluation.

Complete evaluation involves a critical visual inspection. Very often, a great deal can be learned from such an inspection, since the physical pattern of the corrosion products gives information about the type of fluid flow as well as the type of corrosion. Next, the corrosion products are carefully removed from each of the samples. The samples are then accurately weighed to determine the change in weight as a result of exposure.

Results of the field tests are often surprising — surprising to Aloyco engineers as well as to plant operating men.

This kind of situation showed up in the light oil treatment section

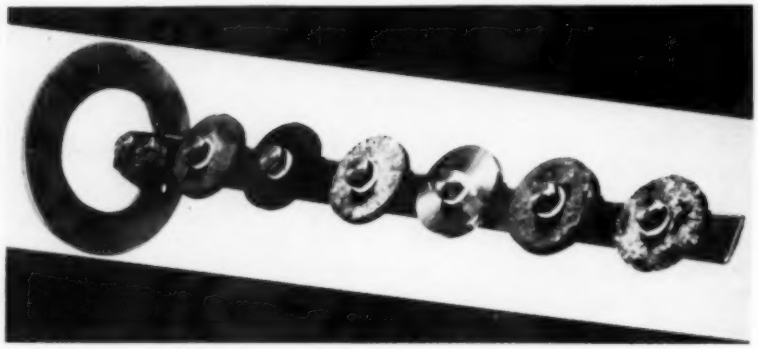


Fig. 1 — Typical Aloyco corrosion rod assembly. This is a "synthetic" assembly for photographic purposes — note difference between corroded and new test specimens.

Fig. 2 — Aloyco test rod assembly is designed with standard ASA flange, to fit between pipe flanges in processing lines.

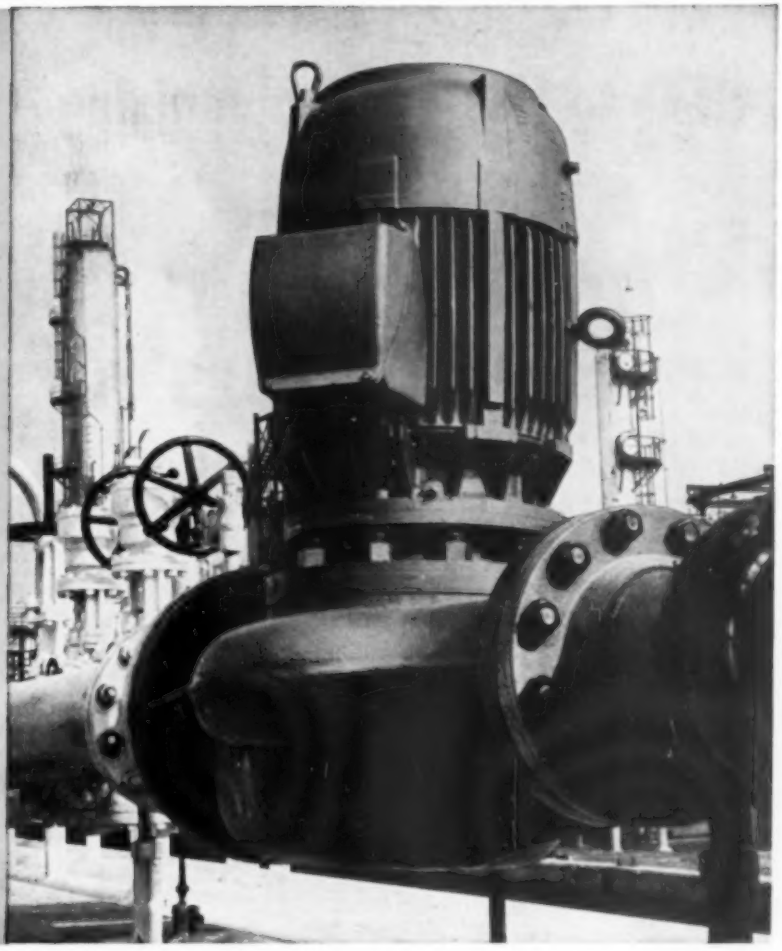
Designed for best Economic Balance

NEW

PACIFIC

TYPE SPM

Pipe-Mounted Transfer and Process Pumps



ECONOMIC BALANCE—an optimum relationship between capital and continuing costs of equipment is especially true in process pumps, whose lifetime operating and maintenance costs may be many times the initial investment.

Here are the factors of best economic balance in process pumping offered by Pacific's new pipe-mounted centrifugal pumps:

LOWER FIRST COST: Fewer (only six functional) parts • No separate pump bearings or brackets • High degree of interchangeability—minimum inventory.

LOWER INSTALLATION COST: No baseplate or foundation required • No field alignment necessary • Integral drive—no motor coupling • Flange-mount and connect to power—that's all.

LOWER MAINTENANCE COST: Standardization of seals and shaft-mounted parts • Ready access, even in closest quarters, for field service, *or* • Easily demounted as a unit for shop maintenance.

LOWER OPERATING COST: Each pump impeller designed for peak efficiency in a given application, *or* • Where low power costs permit, orifice control can be provided to adapt one pump size to a wide variety of applications.

There is only one *true* cost of a process pump. It's the *overall*, lifetime cost of the unit. Make a date with your Pacific Pump representative to discuss the entire pump standardization plan in your plant. He has the broadest line of any in the process field... and the experience to match.

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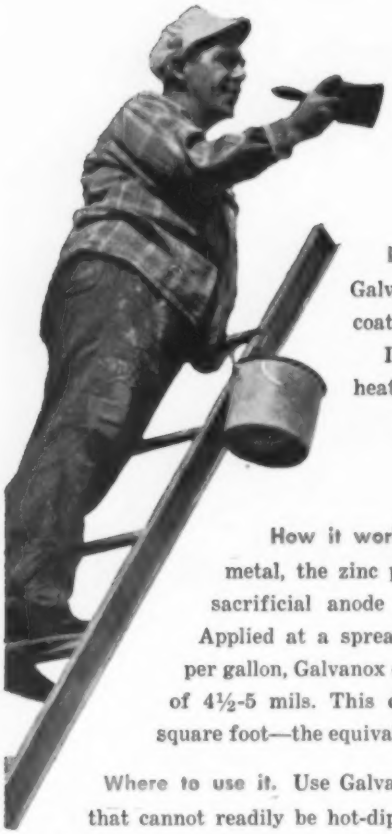
CP-25

Next to Hot-Dip Galvanizing

GALVANOX



DOES IT BEST

Like a paint, but not a paint. Galvanox is a ready-mixed organic coating saturated with metallic zinc It requires no curing agent or heat treatment. Brushed or sprayed on, it provides electro-chemical protection not possible with ordinary paints.

How it works. In direct contact with base metal, the zinc particles in Galvanox act as a sacrificial anode to establish a galvanic cell. Applied at a spread rate of 150-200 square feet per gallon, Galvanox establishes a dry film thickness of 4½-5 mils. This deposits 2 ounces of zinc per square foot—the equivalent of new hot-dip galvanizing.

Where to use it. Use Galvanox to coat any iron members that cannot readily be hot-dip galvanized. Use it to restore galvanized areas damaged during fabrication or construction. Use it to cover welds, drill holes and untreated rivet and bolt heads. Use it to renovate galvanized hardware and guys, pipes, structures and equipment.

Send for a copy of "Galvanox by Subox."

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of a byproduct coke plant. Hydrocarbon oils produced at the plant are treated with concentrated sulfuric acid, and the mixture is then diluted with water. Based on the reported acid concentration in the discharge line — about 40% — engineers originally recommended a cast stainless alloy that is well known for its resistance to a variety of sulfuric acid solutions.

When the plant went into operation, it was found that the solution composition — "dilute" sulfuric acid plus such organic reaction products as sulfonic acid and operating temperatures up to 135 F — were producing unexpectedly high corrosion rates. Consequently, a test rod was inserted in this line.

After evaluating the results of the test, the engineers recommended that valves of Hastelloy C be employed in the line. This recommendation was followed, and valves are still in service after three years of trouble-free operation.

A more typical situation involving pipe line corrosion occurred in an ammonium nitrate production unit of U. S. Industrial Chemicals. Type 304 valves in the loading and circulating lines of the ammoniator were exhibiting appreciable corrosion after handling nitrogen solutions of varying compositions at temperatures varying from 80 to 120 F.

To test for all possible sources of corrosion, the engineers inserted two test rods in the line. Fastened to each test rod were sample coupons of type 304, type 316, Aloyco 20 and Aloyco 25-12S. On one test rod, all samples were insulated from the pipe line by means of Teflon washers and sleeves. On the second test rod all samples were in contact with the line.

After 720 hours of exposure to the line, the rods were removed and sent to the laboratories for evaluation. There was no evidence of corrosive attack with the insulated samples, while some of the uninsulated test coupons showed appreciable corrosive attack. This test proved that the leading cause of corrosion in this line was electrolytic, and that in this particular corrosive environment type 316 stainless steel and Aloyco 20 were not affected.

Metals Handbook

American Society for Metals, Novelty, Ohio, has announced publication of the 8th Edition of the ASM Metals Handbook. The new Vol. 1 — Properties and Selection of Metals, contains 1,300 pages and is priced at $30.00. It is available from the Society.

Numerical information in the form of charts, graphs and tables has been substantially increased from the previous edition. Greater emphasis has been placed on relating metals information to engineering and production practices.

Many first-hand examples and comparisons are included. Practical articles discuss selection of steel for economy in manufacturing and machining. Major sections also cover carbon and low-alloy steels, cast iron, stainless steels and heat-resisting alloys, as well as special-purpose materials.

Atomic Project Progresses — Parr, S. C.

E. M. Simpson, Secretary and Assistant Treasurer of South Carolina Electric and Gas Company, has been elected Secretary-Treasurer of **Carolinas Virginia Nuclear Power Associates.** He fills the vacancy created by the death of J. M. Costello, who also was with SCE&G.

Work on the Southeast's first atomic power project at Parr, S. C. is right on schedule and the plant is expected to begin operation in mid-1962. General Manager Harry Ferguson said research and development activities in various laboratories across the country also are on schedule.

The four associate companies are Carolina Power and Light Company, Duke Power Company, Virginia Electric and Power Company and South Carolina Electric & Gas Company.

Electrical Apparatus Service Association

The name of the National Industrial Service Association, Inc., an international trade association of electrical apparatus service companies in North America, with headquarters in St. Louis, was changed to **Electrical Apparatus Service Association, Inc.,** on April 1. J. Arthur Turner, Jr., Tampa, Florida, is national president.

NEW BIDDLE INSTRUMENTS Products

Conductor Phase Identification Set Saves Labor Costs

on Phase Determination and Conductor Identification on Underground Cable Systems

The Biddle Conductor Phase Identification Set employs a unique circuit that provides positive and reliable identification *without the need for removing all safety grounds.* Transmitter can be operated from either 60-cycle supply or self-contained dry cells. The detector is similar to a clamp-on ammeter. When clamped around A phase conductor, the pointer deflects left; when clamped around B phase conductor, it deflects right; when clamped around C phase, there is no deflection. Pick-up coil and earphone unit is used with transmitter to identify the cable itself. This means of positive cable identification results in safer operations and reduced labor costs.

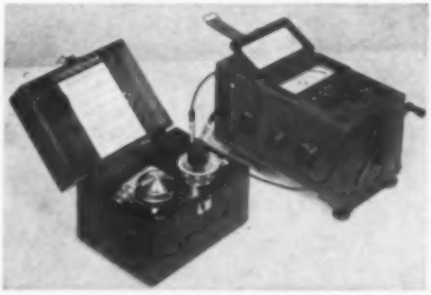
Write for BULLETIN 82SP

Complete set includes transmitter, phasing detector and cable identification detector.

Biddle-Balsbaugh Test Cell Kit for Liquids

This kit is used with a Megger insulation resistance tester to make resistivity measurements of insulating oils and other liquids. Useable at test voltages up to 5,000 volts d-c. For complete details—

Write for BULLETIN 21-OCSP



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Electrical and Speed Measuring Instruments

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Southern Seed Processor Stops Pipe Clogging and Bearing Failures

Specialized Lubricant

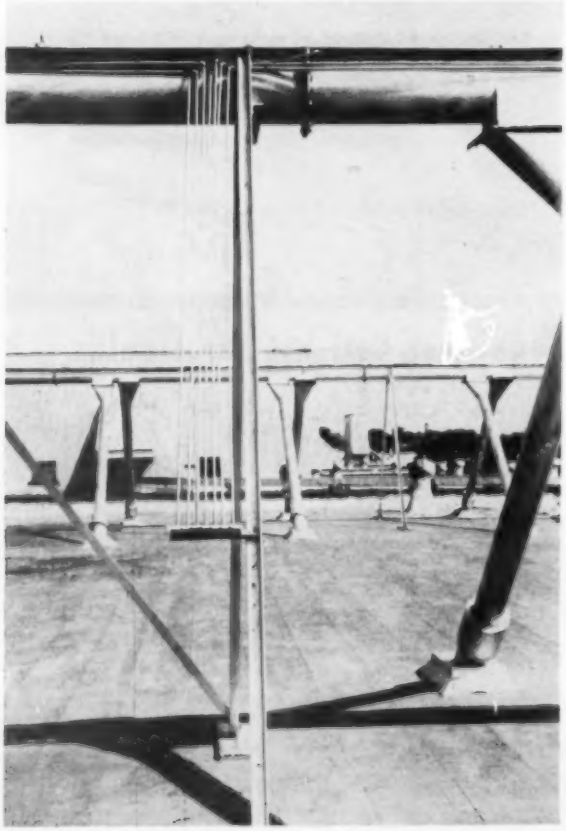
A SEED processor faced a serious maintenance problem when grease separated and solidified in the narrow tubing used to lubricate bearings on its numerous screw and small-bucket elevator conveyors. Deprived of lubricant, the bearings burned out, shutting down this equipment. Maintenance costs were high and production was lost.

The conveyors are located throughout the plant, and are lubricated from central points. Lubricant is carried to the bearings through ⅛-in galvanized iron pipe over distances up to 75 feet. Some pipes make 90 degree turns.

The plant superintendent, studying the problem, realized that he needed a lubricant that would not separate in the narrow tubing. Turning to a specialized lubricant as the solution, he chose Keystone No. 44. Made by the Keystone Lubricating Company, this is a smooth non-fibrous lubricant with a high oil content. It does not separate and assures instant activity with low starting and running torque.

Since the changeover, the company reports no clogging of lines and no bearing failures due to faulty lubrication. Downtime is minimal and maintenance costs have dropped sharply. Since there has been no oil drippage, the plant is cleaner and safer.

LEFT — Sharp turns in tubing carrying lubricant to bearings of this and other screw conveyors created problem when grease solidified in lines. Bearings in this rooftop conveyor are serviced from a bank of seven fittings.



RIGHT — Employee greases bank of fittings with a non-fibrous lubricant with high oil content. It readily passes through small pipe for distances up to 75 feet. Both plain and anti-friction bearings are lubricated.

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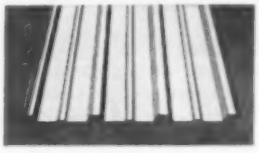

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American Zinc Institute Provides Information to Help Fight Corrosion

ZINC-COATED STEEL

GALVANIZED steel supplies excellent long-range corrosion protection coupled with high structural strength. It offers these characteristics at low initial cost and with minimum maintenance.

Readily available from mills or through the steel industry warehouse system and in immediately usable form, galvanized steel sheets are simple and inexpensive to install. They will serve for years without maintenance in most atmospheres.

Protection of structural steel framework members from corrosion is also important, especially so in Southern chemical plants. Hot dip galvanizing is one of the most desirable methods for control. The heavy zinc coating thicknesses commonly applied to structural parts will withstand the abrasive action of rough service and afford maximum protection.

Since hot-dip galvanizing of structural steel before construction can be a mass-production operation, price of such zinc coatings is relatively low — with heavy members and volume, on the order of $50 or $60 per ton.

Galvanized Iron Stands Up on Gulf Coast

WHEN CELANESE CORPORATION of America built its multi-million dollar Fortiflex plant for production of low-pressure polyethylene in 1956, galvanized structural steel was used in preference to painted steel in all exposed outdoor areas — including pipe supports, outdoor structures and platforms, ladders, and stairways.

This plant, situated on a 200-acre site in the industrial area near the Houston Ship Channel, is exposed to moist winds from Galveston Bay. In addition to the troublesome Gulf Coast atmosphere, there is danger of exposure of painted surfaces to hot process solvent.

Celanese based its use of galvanized steel on experience gained in the Gulf area at its petrochemical plant located near Bishop, Texas. Experience there has shown paint maintenance to be costly, requiring new finish coats every 4 years. On the other hand, galvanized steel catwalks at Bishop were reported still in good condition after 10 years of service.

ANOTHER ILLUSTRATION of the long-range advantages of galvanizing steel for corrosion-control is seen in the oil fields. Here hot dip galvanized storage tanks have found solid acceptance to resist the chemical attack in areas like the Gulf Coast where the crude is high in hydrogen sulfide, and where salt water entrained in the oil can create serious corrosion problems.

Much oil is also extracted in the swamp lands of Louisiana and Texas where atmospheric conditions lead to corrosion on the outside of tanks. Many oil companies in these regions have found that galvanized tanks resist successfully the corrosive attack of both the atmosphere and all types of sour crude.

Anti-Corrosion Mechanisms

Because of its position in the galvanic series, zinc protects iron and steel from corrosion in two ways: first, as a mechanical barrier to exclude the corrosive attack of all kinds of atmospheres; secondly through galvanic action, by sacrificing itself slowly while saving the basis metal from rust.

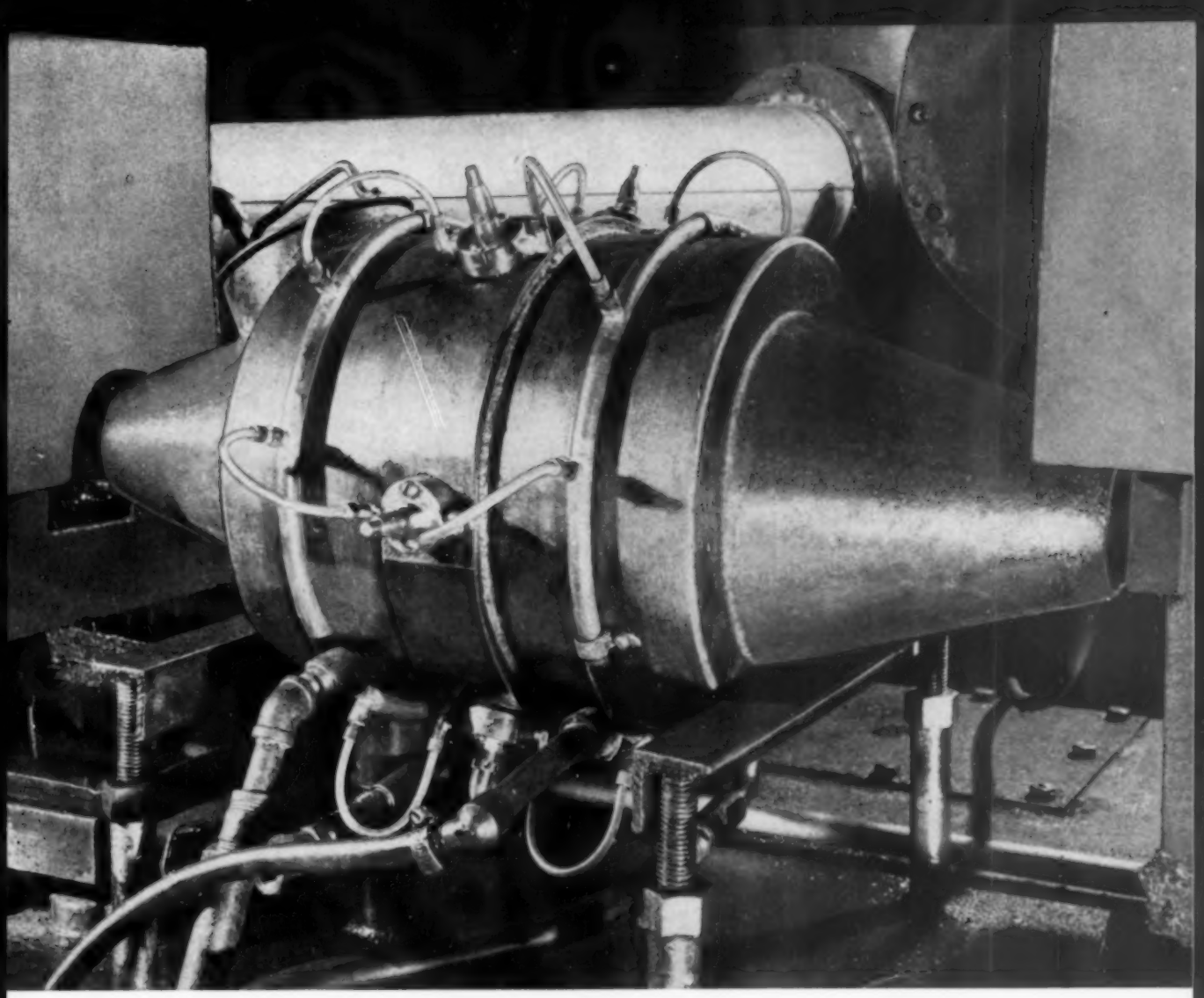
This "sacrificial" action, an electrochemical mechanism whereby the zinc acts as an anode to the steel, is unique among corrosion-protection systems. It extends the service life of the steel substantially, since zinc's protective action takes over and continues effectively after significant areas of steel become exposed.

However, before this mechanism comes into play, the simple "sheath" value of zinc provides extremely effective protection, for zinc is substantially more corrosion-resistant than steel. Comparisons show that the corrosion rate of iron vs. zinc is 25 to 1 in marine atmospheres and 15.7 to 1 in certain normal industrial areas.

Application Methods

Zinc coatings can be applied in five ways: by (1) hot dip galvanizing, (2) electrogalvanizing, (3) metallizing or spraying, (4) sherardizing, and (5) painting. Each has its specific reason for use in certain applications. However, experience has demonstrated that the method of applying the zinc coating is of minor significance and that the service life before rusting is normally in direct proportion to the weight of the coating.

Hot Dip Galvanizing is the most widely used method for protecting steel against corrosion (billions of pounds per year). Zinc is especially



Here's where pressure tubing is wrapped in a protective fog

As soon as USS National Seamless Pressure Tubing has passed its soundness tests it is protected against corrosion. A mixture of specially compounded warm oil and air is sprayed as a fog on the tubing. The oil quickly dries and forms a clear, protective coating .0015″ thick. It acts as protection against corrosion during shipment and storage, and is yours for the asking *at no extra cost.*

USS National Seamless Pressure Tubes are safe. They are made by piercing a white hot steel billet of the finest steel. Rigid testing of each length of pressure tubing is added insurance against trouble.

For your next installation, consider USS National Seamless Pressure Tubing. It's stocked all over the country by National Tube Distributors. They can furnish helpful information on the use of USS National Seamless Pressure Tubing and give you speedy, efficient delivery. Our trained Mill Service Force is also available for field consultation by writing: National Tube Division, United States Steel, 525 William Penn Place, Pittsburgh 30, Pa.

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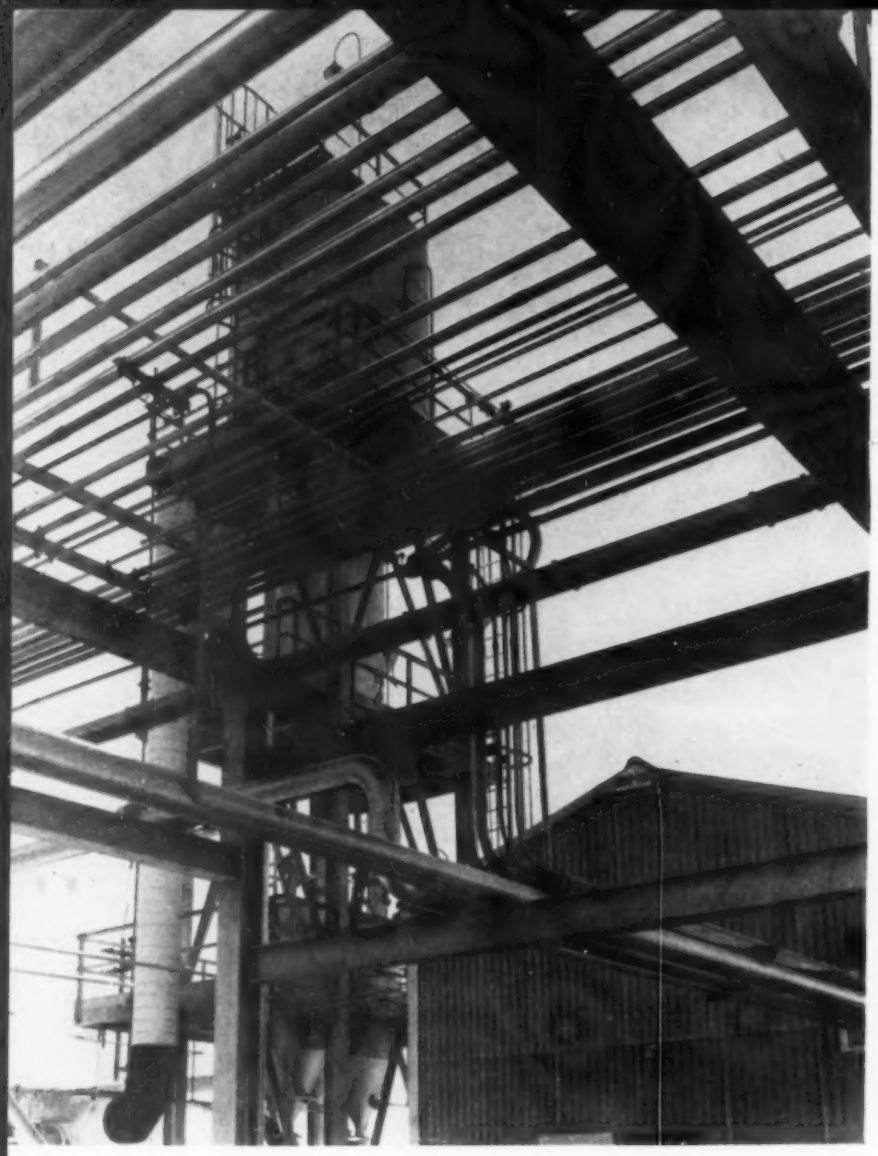
This mark tells you a product is made of modern, dependable Steel.



Houston Celanese Corporation of America Fortiflex polyethylene plant. Horizontal and vertical I-beams are galvanized, as are the instrument line protective trough and expanded metal bottom. Safety ladder, platforms, hand rails, floors on structure in background are also galvanized.

adaptable for this purpose because of its low melting point and inherent tendency to alloy with the steel.

Electrodeposition consists of passing steel with a carefully prepared surface through a solution of zinc salts in which an electric current flows from the metal source (zinc anodes) to the steel to be coated. The amount of zinc which is deposited can be closely controlled, and varies with the current flow and the speed with which the steel travels through the bath.

Metallizing is a spray process whereby pure zinc wire or powder is passed through a gun and melted in an oxyacetelene flame, atomized by a blast of compressed air, and projected at high velocity onto the sand-blasted steel surface to be coated. The particles adhere and mesh, forming a coating of controllable thickness, essentially continuous, but somewhat porous. When porosity is disadvantageous, sealants are available and practical.

Sherardizing is a process in which steel parts are thoroughly cleaned, packed with zinc dust in an air-tight container, which is then revolved and heated to a predetermined and controlled temperature, close to, but below the melting point of zinc. In the intimate contact and heat, the zinc readily impregnates steel and provides a thin, uniform coating.

Zinc Pigmented Paints. One variety is formulated with 90-97 per cent metallic zinc dust in the dry film. Special types of vehicles that have sufficient strength to carry the heavy pigment concentration and still provide good adherence are used. Test evidence indicates that when properly applied to a grit-blasted surface these paints protect steel cathodically in addition to providing a protective coating. The high zinc content results from electrical contact between the zinc particles in the paint and the steel.

Coating Thickness

With galvanized steel, rust-free service is a direct function of zinc coating thickness. This fact is substantiated by a recent ASTM report which shows results of exposure on galvanized sheets in a number of geographical locations.

How to Specify

Because the amount of zinc coating determines the rust-free life of galvanized sheet, a heavy coat of zinc is most desirable.

The weight of zinc coating on galvanized steel sheet is usually stated in ounces per square foot of sheet. A 2-ounce coating, for example, means that there is a total of two ounces of zinc on the two sides of a square foot of the flat sheet, or approximately one ounce on each side.

American Society for Testing Materials has two widely used specifications covering galvanized sheet steel. These are A93-59T, *Zinc Coated (Galvanized) Iron or Steel Sheets, Coils and Cut Lengths*, covering all weights of coatings commercially available from light commercial to 2¾ ounces per square foot; and A361-59T, *1.25*

Ounce Class Coating (Pot Yield) Zinc Coated (Galvanized) Iron or Steel Roofing Sheets, which covers the most broadly used variety, the same as 1.25 ounce sheet from A93-59T.

Care and Maintenance

Eventually, of course, weather and wear will reduce the effectiveness of zinc-coated steel to a level that it must be reinforced. The processes of corrosion to which all materials are subject, plus the slow loss that accompanies zinc's "sacrificial" protection, will finally remove enough of the metal to warrant maintenance painting.

Simple removal of rust by wire brushing, followed by application of suitable paints in accordance with recommended practice, will result in lengthened service and good looks.

Metallic Zinc Paint

For best results, galvanized roofing and siding should be painted with zinc dust-zinc oxide paint, which is commercially available and also commonly known as Metallic Zinc Paint (MZP). Broad experience in the field of plant maintenance has shown that this variety of paint is the best for the purpose.

Metallic zinc paint in untinted form imparts the familiar "battleship gray." It is also available in red, green and buff. Zinc dust and zinc oxide in MZP provide an exceptionally elastic film that adjusts to expansion and contraction changes. Thus, an unbroken, durable protective coating is assured over a long period of exposure.

Painting White

Although new galvanized steel is shiny and will reflect away a substantial amount of light and heat, the metal will reflect substantially more when painted white. Where heat reflection is important, a two-coat system is best. A good grade exterior white paint containing zinc oxide applied over a base coat of metallic zinc paint is recommended. The zinc oxide bearing finish coat is important for exterior applications to provide self-cleansing properties, controlled chalking, whiteness, mildew resistance, and durability.

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How to Paint Water Tanks

By T. J. EBERHARDT
Vice-President of Subox Inc.
Paint Manufacturers

MAINTENANCE of elevated steel water tanks presents many problems, among which painting is perhaps most important.

When considering paints and painting systems, both old and new, for the prevention of rust and corrosion, thought must be given to the effectiveness and cost and also to the time required to minimize shut-down periods, the safety of application, and the simplicity of future maintenance.

Considerable inconvenience and extra expense may be necessary to provide a suitable water supply while tanks are being painted or repaired. Fire insurance and safety also make demands for minimum out-of-service periods. Therefore speed may dominate other factors that influence the selection of a painting procedure.

Painting Interiors

Most water tanks have limited access through manholes and poor ventilation for proper painting. Induced air ventilation is often required for safety in cleaning and painting operations. With this fact in mind, only paints having a flash point over 80 F will be discussed here.

The interior of water tanks present three different types of paint exposures:

1. UNDERWATER: Areas continually submerged may be protected by paint systems, with or without cathodic protection (induced current flow).

2. WATER-LINE: Here the areas may be intermittently wet and dry. In winter, ice may form and cause severe abrasion with changes in the water level.

3. ABOVE WATER: Roof and supporting steel and sides of tank above water line may encounter heavy moisture condensation, and frequent dimensional changes in the steel due to heat changes from hot noontime sun to cool evenings.

First Step

The first step in determining the most suitable painting procedure is to make a thorough examination of the condition of all three areas, and to take into consideration the type of paints or coatings previously applied. Some areas may be found to be in good sound condition, and others completely rusted. In such cases, a flexible system may be employed involving only partial painting. Hand cleaning of the steel is usually the preferred method in such cases and the paint system selected would have to tolerate such surfaces. In other cases, general corrosion may suggest that all areas be thoroughly sandblasted to secure a firm paint foundation, and in this case, a much wider selection of the paint systems is available.

Where all old paint is not to be removed, the new paint should be selected for compatability and adhesion. Where oleo-resinous paints have been used, paints containing similar vehicles (liquid portion) are again suggested. Where vinyls or catalyzed epoxy coatings have been used in the past, they should again be favored.

Second Step

The second step is to decide what method of surface preparation is to be used, and to what extent. Sandblasting to white metal is, of course, the preferred system, and is generally used where rusting is general or when 30% or more of the total square foot area shows prior paint film break-down.

Hand Cleaning

Maintenance painting done in time saves money as it generally eliminates the need for complete cleaning to white metal. Where 70% or more of the old paint remains firmly adhering to the base steel and is continuing to offer good protection, the remaining areas can be touched up or repaired comparatively easy. They may be hand scraped and cleaned by wire brushing or power sanding, and then primed with a penetrating oil type paint.

Primers containing lead-suboxide as base pigments offer a special advantage in that the lead-suboxide is an unstable form of lead, and after application and drying undergoes progressive chemical changes. The pigment and vehicle react together to form rust-inhibitive, insoluble lead soaps which eventually replace and strengthen the original oil film, and at the same time deposit minute particles of metallic lead on the surface, making the coating appear more like a thin lead plating than a paint coat.

When the spot primer has dried (usually 48 hours required between coats), one complete primer paint coat is recommended over all the interior steel surfaces. Because of its exceptional wetting properties, it usually penetrates into and reinforces old paint coats and extends their useful life.

While we know of no cases where the use of lead paints have caused lead poisoning in potable water tanks, many engineers feel safer to use a non-lead paint for the finish coat. To insulate any lead from coming in direct contact with the water, a coat of straight aluminum paint in a long oil-phenolic vehicle provides a metallic fish-scale-like armour which also provides further protection and hardness.

This system has the advantage of low cleaning cost, ease of application by brush, spray or roller, safe flash points of over 100 F, works well alone or in conjunction with a cathodic system, is easy to repaint when required, and has an average life of from 4 to 6 years.

Sandblasting

Where sandblasting to white metal is required to remove all old paint coats due to poor adhesion or general failure, the same oil type paint system may again be employed for repainting, or the fol-

lowing newer systems which have other advantages should be considered.

Zinc-Rich Systems

In the class of zinc-rich coatings, ready-mixed paints are formulated with as much as 95% pure metallic zinc in special binders. While they weigh about 25 pounds to the gallon, they are easily applied either by brush or spray, dry to touch in an hour, and can be recoated in 4 hours. Usually two coats are recommended over sandblasted surfaces to establish a dry film thickness of not less than 5 mils.

The coatings are electrically conductive. The zinc thus acts as an expendable sacrificial anode and the steel as the cathode. A galvanic cell is established very similar in principle to that of hot dip galvanizing. The current generated by this cell not only protects the underlying steel, but is also strong enough to protect adjacent areas which may become scratched or damaged mechanically right down to bare steel.

This system has been used alone and has an indicated life of more than 8 years. Then an additional coat can be applied directly to the remaining zinc without difficulty and thereby furnish many additional years of life.

Zinc-rich paints have been used in conjunction with other protective paints too. When the zinc-rich has been applied and dried, an extra finish coat of an epoxy-ester paint is used. The purpose of this is to slow down the sacrificial anodic action of the zinc and thereby extend its life. As this system is of comparatively recent development, no true life expectancy or repaint surface requirement has yet been established.

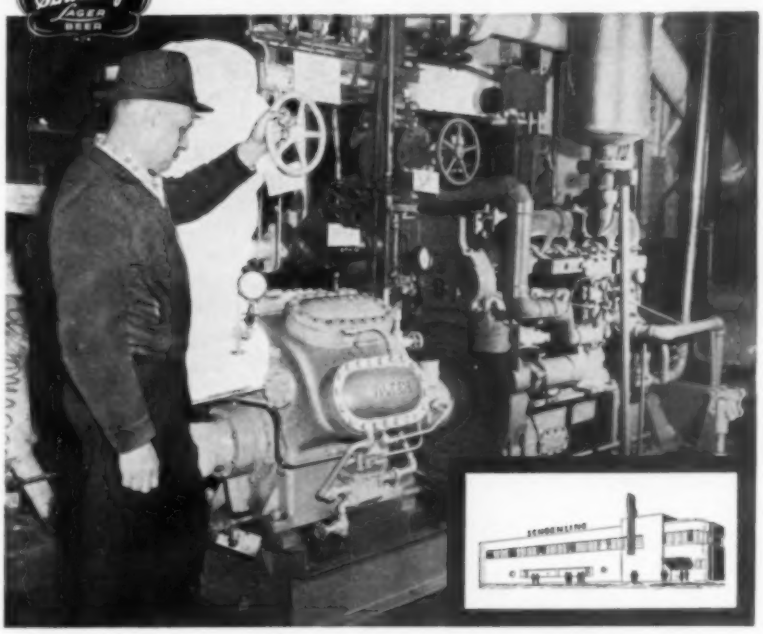
Epoxy Coatings

Epoxy resins, as currently produced, show exceptional impermeability to moisture and resistance to alkaline exposures. They have tenacious adhesion when applied to sandblasted surfaces, forming a "plastic" type coating especially suited for use in conjunction with cathodic protection (induced current) systems.

Paints in this class are delivered in two components, a liquid paint

Top Efficiency Brewing Schoenling with a Gas Driven Vilter Compressor

The Schoenling Brewing Co., Cincinnati, has earned a reputation for fine beer with Schoenling Cincinnati's Finest.



Mr. Raymond Winterhalter, Chief Engineer, The Schoenling Brewing Co., inspecting the gas driven Vilter VMC ammonia compressor. Inset shows exterior view of the brewery.

To most efficiently meet summer brewery refrigeration requirements, the Schoenling Brewing Co. has added a Vilter 8-cylinder VMC ammonia compressor driven by a natural gas engine to its earlier purchased electric motor driven Vilter compressors.

By switching to the natural gas engine driven compressor during the summer months, when its gas requirement for heating purposes is reduced, Schoenling is able to utilize the major portion of the gas charged for, thereby reducing electric power demand and effecting considerable savings.

The natural gas engine driven compressor is especially ideal where capacity reduction is necessary to match widely fluctuating loads. Automatic speed regulation of the power unit can be supplied so that, together with the automatic capacity control available on Vilter VMC compressors, the most economical engine speed to suit the refrigeration requirements is automatically selected and maintained.

Schoenling is well pleased with the operation of the gas driven Vilter VMC compressor, and as a result of the reliability obtained, they have been able to reduce their cost of operation.

Almost 90 years of service to the brewing industry has given Vilter the necessary experience to produce the superior refrigeration equipment used with satisfaction in hundreds of breweries throughout the world. Let our qualified engineers help you with your problems.

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Air Units • Ammonia and Freon Compressors • Booster Compressors Baudelot Coolers • Water and Brine Coolers • Blast Freezers Evaporative and Shell and Tube Condensers • Pipe Coils Valves and Fittings • Pakice and Polarflake Ice machines.

Write for Bulletin 017 to The Vilter Manufacturing Company, Dept. SP-602 2217 South First Street Milwaukee 7, Wisconsin

and a liquid catalyst. The two parts are mixed together on the job and the paint must be applied that same day. The catalyst causes the paint to cure chemically, which results in coatings having most of the qualities previously only obtainable by oven baking. Primers are formulated with lead-suboxide pigments too, so rust-inhibitive protection similar to the old time red-lead or lead-suboxide oil paints remains effective.

The catalyzed epoxy paints have additional advantages. They can be applied to damp or even wet steel surfaces and will dry and cure under very moist or humid conditions — a feature not found in other paints. They can usually be recoated within 24 to 48 hours, depending upon ambient temperatures.

Painting Exteriors

The exterior surfaces of water tanks are attacked by wind, sun, rain, and condensed moisture, and sometimes by locally contaminated air in industrial locations. They are painted for both protective and decorative purposes.

Unless a poor initial paint coat was applied, or if the steel was not properly prepared prior to the initial painting, it is not usually necessary to sandblast or remove all old coats to bare metal. Hand cleaning generally is the practice. Then bare areas are touched up with a spot primer and then one complete covering coat is applied.

The primer paint used for the touch-up painting should be of the oil type, with good wetting and penetrating properties. These properties alone, however, are not sufficient. The paints should also contain metallic inhibitive pigments which will continue to give effective inhibition after the organic oils have decomposed by weather attack. The chromates, red-lead and lead-suboxide are preferred pigments for such primers, the latter being favored because of its hardness and weatherability, an important property which allows it to continue its protection even after the covering coats have worn away.

Color Coats

The many tragic air accidents of the past winter are causing great pressures in our capital for tighter rules and regulations of tall structures which may be hazardous to air navigation. Before considering any other color, it is suggested that the very location and height of the elevated structure be considered, and if it is found to be a possible airway hazard, that it be painted International Orange and White in compliance with FAA rules and regulations, before these become mandatory.

If the matter of color is left strictly to the imagination of the owner, it is suggested that muted tones be selected. These do not show dirt accumulations readily and a neat and attractive appearance is longer lasting. Metallic grays, pastel blues and greens, used either alone or in combinations, can produce very attractive tanks. They eliminate glare and reflections so commonly complained about by neighbors.

Today many attractive colors are available with good color permanency and with rust-inhibitive bases. Such paints not only last well, but reinforce primer paints, thereby greatly extending their life and simplifying future maintenance painting. By their use, generally one complete paint coat can be eliminated at each painting cycle.

The old and the new in paints are being employed together. The combined features can result in fewer coats, in more efficient protection, in more attractive and decorative colors, and in reduced annual maintenance costs.

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See Pages 85 & 86

Glass Panel Heaters Reduce Maintenance Prevent Glare

GLASS PANEL radiant heaters have eliminated the problem of constant replacement of heater parts in an Alabama tee shirt stenciling operation.

The Pyrex brand heaters, a product of Corning Glass Works, have solved other problems for the shirt manufacturer as well. Easy and inexpensive to install, the heating units have resulted in power savings, and because of less wasted heat and reduced glare, they have improved employee performance.

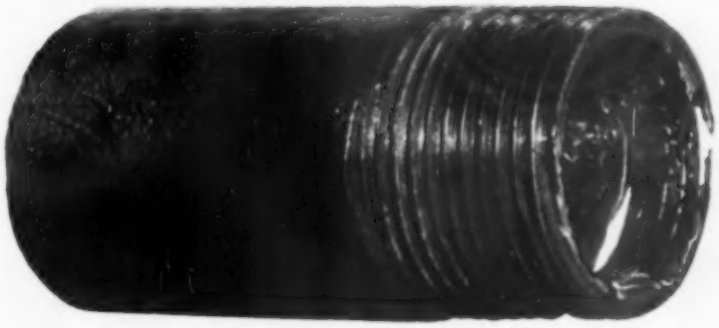
The glass panel heaters took the place of units using quartz tubes which had to be regularly replaced.

The heaters feature a borosilicate glass panel coated with a metallic oxide film that conducts electricity. This film is the source of radiant energy which can supply heat up to 660 F.

The heaters are connected to the electric circuit by means of a standard junction box. The units are available with heating areas ranging from 11¾ by 11¾ inches (750 watts) to 23¾ inches (3750 watts). Heaters usually are wired in parallel, on single phase 115 or 230-v circuits or on balanced 3-phase 230-v circuits.

Normally, the only maintenance required is to keep the heater surface reasonably free of dirt. In most cases, an occasional wiping with a dry cloth is sufficient.

RETURN LINE CORROSION MUST BE STOPPED!



Unheeded build-up of corrosion products and corrosion can shorten return condensate pipe life by years . . . multiply maintenance and replacement costs drastically.

Bird-Archer Amine Treatments, both filming and neutralizing, check severe return line corrosion easily, effectively, and economically. After two years of Amine Treatment, a Massachusetts power plant making over 250,000 lb. of steam per day, enthusiastically reports a 75% reduction in piping replacements with the use of only 2 or 3 lb. of Amine Treatment daily.

Return line corrosion *must* be stopped, and *can* be stopped. Write for Bulletin CP100 and the name of the Bird-Archer Service Engineer nearest you.

BA101

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CORROSION CONTROL
Doesn't Cost — It Saves

By J. B. CAGLE
J. B. Cagle & Associates
Consulting Engineers
Decatur, Georgia

CORROSION can be a serious problem in many large water systems such as are found at municipal water plants, industrial plants, and large apartment buildings. The added expense due to frequent replacement of equipment is only one factor. Product damage, whether the product is fabric in a textile mill or the water itself as in an apartment building, can lead to loss of business. Excessive down time is a very serious matter to an industrial plant and can be disastrous to an apartment building or hotel. Furthermore, corrosion products can reduce the capacity of the system and increase pumping costs.

There are two primary problems to be solved in setting up a program of corrosion control of this sort other than the principal one of selecting the proper chemical for corrosion inhibition. These problems are:

(1) The chemicals selected must have absolutely no effect on the potability or color of the water and must be approved by public health officials from the physiological standpoint.

(2) In systems using millions of gallons of water each month the cost of chemical treatment could be prohibitive. Therefore, cost must be one of the deciding factors in selecting the proper chemical treatment.

An apartment building containing over 500 units was faced with numerous complaints of rusty water in both hot and cold lines. Frequent replacement of lines, valves, etc., was adding to operating expenses at an ever increasing rate. No economic justification was necessary here. It was a matter of —solve the problem or lose tenants.

An examination of several segments of both hot and cold water lines showed tuberculation which indicated oxygen corrosion. The iron content of the water supply was not high enough to present a problem from so-called "red water." The water was found to be comparatively free of calcium and magnesium hardness.

On the basis of all data gathered and cost figures, 41 degree Baume sodium silicate was selected for the corrosion inhibitor. The reasons for this selection were:

(1) It is a film-forming corrosion inhibitor which is particularly effective against tuberculation in waters of low hardness. Silica from the sodium silicate is adsorbed onto the metal surface. The film does not build on itself and therefore does not obstruct the flow of water.

(2) The amount of sodium silicate needed is in the neighborhood of 8 parts per million. Since it is an inexpensive material, the cost of treating a large volume of water is within reason.

(3) Sodium silicate in the quantities required has no effect on the potability or color of the water. The U. S. Public Health Service as well as most departments of health allow its use for corrosion control in drinking water.

A large storage tank was located on the roof of the building with booster pumps in the basement to provide sufficient pressure to carry the water to the roof (18 stories). On the basis of available figures the maximum consumption of water was found to be 3,750,000 gallons per month with only a slight variation from month to month.

It was decided that a continuous feed of sodium silicate to the storage tank would provide reasonably

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uniform treatment to all lines. A positive displacement proportioning pump was installed in the basement with a chemical storage tank so that a definite amount of sodium silicate solution could be pumped directly into the pressure side of the booster pump, and thereby carried to the roof storage tank.

For the first thirty days the silica content was kept at an average of 24 parts per million and then reduced to 8 parts per million for a permanent dosage. The initial high dosage assisted in establishing a quick protective film. After the first thirty day period the daily cost of treatment was only $0.78.

Test sections of pipe have shown no signs of tuberculation, and there were no reports of rusty water after the first month of treatment.

A program of this type for corrosion control would be applicable in many manufacturing plants where the water is used for various purposes. The pH of the water is not appreciably affected by the treatment; and the silica film has no measurable effect on heat transfer.

In some types of systems where toxicity of the treatment is not of importance, a different approach is required. For example, in the case of refrigeration cooling water systems utilizing a cooling tower or evaporative condenser, large quantities of air are absorbed by the water; and the danger of tuberculation due to dissolved oxygen is greatly increased. In these cases, sodium chromate or a dianodic treatment of sodium chromate and sodium polyphosphate will be required.

Avoid Denting Balls and Raceways

INSTRUCTION in proper mounting of bearings to prevent damage and premature failure under operating conditions is one of the subjects covered in a series of traveling maintenance seminars

DO YOU KNOW WHAT METALLIZING CAN DO FOR YOU TODAY?

With today's improved metallizing materials and methods:

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These real-life examples show how plants save money with metallizing:

Necks of winding rolls in a textile mill were formerly repaired by a slow machining method, requiring highly skilled labor. Now the worn necks are built up with flame sprayed metal, quickly machined to size. Savings run $20,000 a year.

Valve plugs and seats, working in sand, oil and salt water, lasted only a few hours in service. Hard-faced by welding, a set cost $155, lasted from 3 to 8 hours. When flame sprayed with tungsten carbide powder, service life was increased to a minimum of *2 weeks*, 4100% longer! Cost of metallized set, $73. But reduced downtime far outweighs the dollar savings.

A Connecticut company was sending its worn shafts out for repair by welding at a cost of $50 each. Then they found a local shop that specialized in metallizing was able to do a better job for $27.50. The same job shop salvaged a big degreasing tank, value $2,850, by flame spraying with zinc for $683. The shop made money, the customer saved money.

A shipbuilding company installed metallizing equipment to repair such parts as pump rods, pistons, crank shafts for diesel engines, stern bushings, valve stems. A badly worn tugboat shaft, replacement cost $3,000, was repaired and made better than new for $400. That job alone more than paid for the METCO equipment.

From these cases you can see how modern metallizing pays, whether in plant maintenance departments or in job shops serving the many companies that don't need their own installation. Wherever there's wear, in rotary or sliding action, there's an opportunity to save money and make money.

New and improved materials

Among these new materials are a number of nickel, chrome, boron hard facing powders. Sprayed tungsten carbides are also widely used. Many others are available to give new values to the basic benefits of metallizing, which may be summarized as: less downtime; far less machining or grinding time, reduced parts inventory; and "better than new" performance of the metallized parts.

With savings like these there are big opportunities for more efficient maintenance operations, either with METCO installations or through local job shops.

To explore these advantages and see how they apply to your operation, check the coupon below and send it off today.

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now being conducted by The Fafnir Bearing Company, world's largest independent manufacturer of ball bearings.

A frequent cause of ball bearing failure is the brinelling or denting which sometimes appears high on the shoulder of the race and correspondingly on each ball. This happens most often when extra force is applied against the unmounted ring while mounting a bearing on a shaft with a very close fit. Pushing of the outer ring exerts an excessive thrust load, bringing the balls into sharp contact with the race shoulder. The result is a brinell.

Radial indentations may also be imposed on a non-rotating bearing by hitting it with a hammer or by an operating shock load exerted on a static shaft. This type of brinell is less common than that caused by mounting, because the rings are likely to fracture under the sharp impact of radial shock load.

In mounting a bearing, Fafnir advises, force should always be exerted against the ring being mounted: i.e., the inner ring in mounting on a shaft, the outer ring in mounting on a housing. In other words, the ring having the tighter fit (usually the ring which will rotate in application) should be pressed. Installers are cautioned to apply the mounting pressure slowly and evenly.

Electrical Troubles

(Continued from page 34)

trifugal pumps, fans, some compressors, some conveyors, motor-generators, vacuum pumps. Here the test-card certainly can help shorten down-time, in that a reference is close at hand to indicate volt and ampere conditions under normal operations.

Using the centrifugal water pump as example, let us assume the 10 hp motor, 3-phase, 220 volt, 3450 rpm, 29 amp, to be direct-connected. The complaint comes in that the pump is not delivering its normal volume of water. The test-card on the motor controller shows 28 amp for normal operation.

Now, the clamp-on reads 23 amp average of the three-phases. With line voltage tallying with the test-card voltage data, this indicates at once a fault in the water system. Actually, it would point to a fault in either side of the water system, such as a partially-closed valve, keeping the pump from receiving or delivering full volume.

Bench-Testing Motors

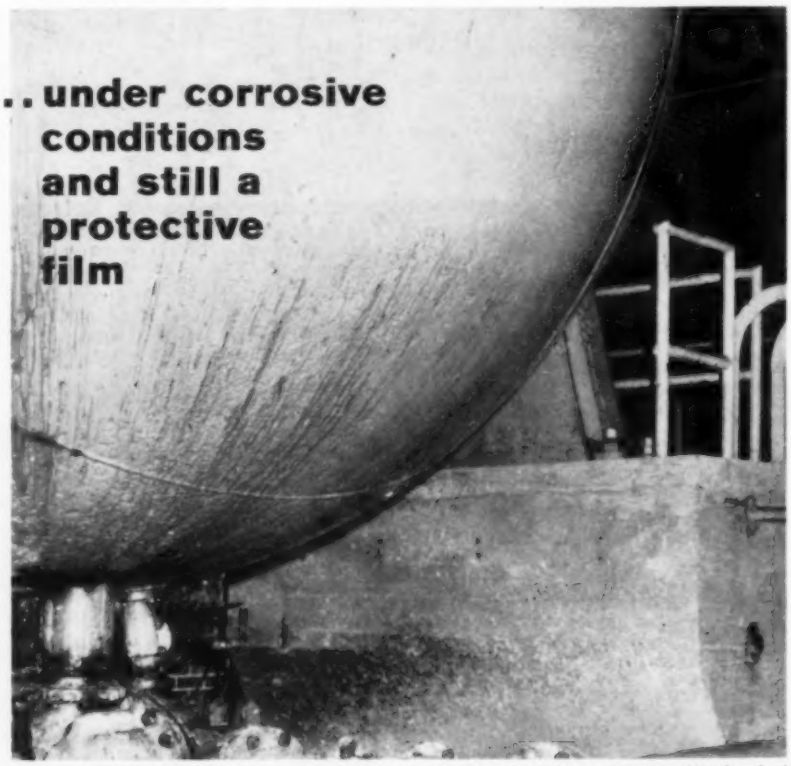
On the work-bench there are many uses for the clamp-on meter, principally the amperage feature. For instance, the induction rotor mentioned in the first example can readily be tested for loose or open bars. This test requires only the clamp-on and an armature test growler. The growler should be of medium size, about seven inches across the jaws.

The rotor is placed on the growler, and the clamp-on is clamped around the line feeding the growler. If the growler has the high-low type of winding, the switch is

5 YEARS... under corrosive conditions and still a protective film

In early 1956 Porter M. C. R. Finish was applied on a chlorinator sphere at Olin-Mathieson Chemical Corporation's Ecusta Paper Operation. Today, some five years later, the paint film needs no attention. The coating is still sound . . . providing full protection against corrosive agents.

This is just one example of how Porter custom-tailored paint engineering can save time, work and money in a plant maintenance program. Why not learn how the Porter Program of Industrial Maintenance can be applied to your own specific problems. Write today for your copy of the Porter Industrial Maintenence Folder.



Chlorinator sphere at the Ecusta Paper Operation, Pisgah Forest, North Carolina. Unretouched photograph, taken in 1961, shows how the sphere looks five years after Porter M. C. R. Finish was applied. Upper right hand surface is shown after chemical stains were washed off with water. Pitting took place before painting. Dark areas are unwashed chemical deposits.

Porter Paint Co.

Technical Sales Division
P. O. Box 1439, Louisville 1, Kentucky

turned to the highest flux point. This is to induce the largest current in the rotor. Now, note the amperage reading on the clamp-on, say 17½ amp. Next, very slowly turn the rotor in the growler, taking care not to lift or twist the rotor away from the laminated jaws of the growler. It will be hard thus to turn the rotor, because of the pull of the growler. It should be done slowly, pressing the rotor down.

If there are no loose or open bars in the rotor, there will be practically no fluctuation, or deflection, of the meter needle. Any broken or open bar joints will immediately cause a deflection of the meter, usually not more than 1 to 3 amp at the most, even for broken bars.

The clamp-on can be used in testing 440 volt motors in the shop, running the motor on 220 volts, idle. Thus, supplying half-voltage to the motor, the amperage per phase will usually read about 10% or 12% of name plate amperage for 440 volts. The windings thus are checked for balanced current, and it is possible to get a comprehensive locked-rotor test without the expensive dynamometer, by keeping a record of readings for various size motors fed with half-voltage.

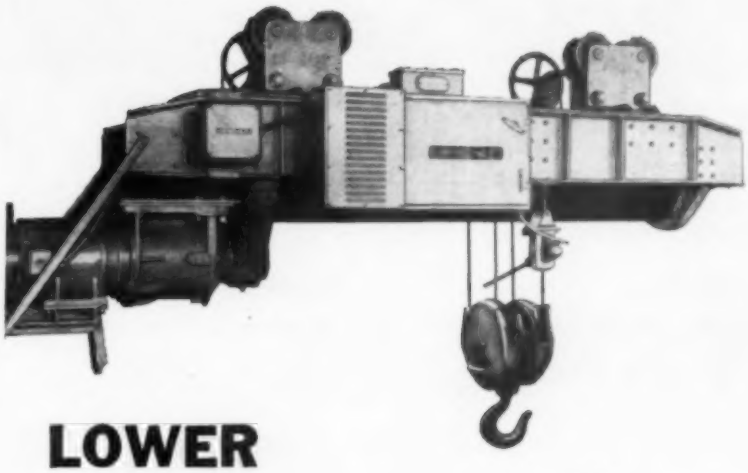
Reading Small Loads

Sometimes it is necessary to read amperage on very small equipment, such as ¼ hp motors, 440 volts, or solenoid valve-coil loads of .2 or .3 amp. This is right down the alley for the clamp-on. Simply take ten turns of one feeder wire through the jaws of the clamp-on, and it multiplies the load reading by ten. For example, a solenoid valve drawing .2 amp, would give a scale reading of 2 amp tested thus. Many times looping the feeder wire two or three times is sufficient for easy reading.

It is important, in the use of the clamp-on, to always start the reading on the higher scale of the meter, then move the selector switch to a middle scale reading. This saves the meter from "bumping the peg," and injuring the true-reading qualities of the meter.

Versatile? The clamp-on voltammeter is truly the *Tool of a Million Uses.*

Shepard Niles JOB-MATED Hoists



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6—Tool Truck — Save time with this compact truck carrying full tool selection to emergency repair jobs. Four drawer unit described in Bulletin 8141-A. Semi-pneumatic 10" balloon tires ease heavy loads over rough pavements. — SNAP-ON TOOLS CORPORATION.

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14—Hose & Fitting Needs—Complete Weatherhead line described in bulletins — flared, flareless, or pipe fittings; brass, stainless, carbon; pressures to 10,000 psi; sizes ⅛" to 2" O.D.; production or small maintenance quantities. — DIESEL INJECTION SALES & SERVICE.

18 — Maintenance Ideas — 4 page folder highlights 90 ways Kano Kroil and other products can help the man-in-the-plant.—KANO LABORATORIES.

24—Roof Maintenance—4 page Catalog 5D describes Dri-N-Tite products for patching, priming and coating composition, corrugated or sheet metal, slag, gravel, concrete and felt roofs. — A. C. HORN COMPANIES.

27—Corrosion Control Systems—Brochure 9111 outlines five-step procedure for primary protection and preventive maintenance of all metal surfaces subject to acids, alkalis, solvents, fumes and gases.—TRUSCON LABORATORIES.

35—Stop Corrosion—4 page bulletin tells how Alkasteem neutralizes carbon dioxide and Ox-Gem reacts with oxygen to stop corrosion in boilers, heaters, condensate returns, steam lines and traps.—ANDERSON CHEMICAL COMPANY, INC.

37—Maintenance Gun—Brochure describes the Von Arx Air Gun — lightweight tool for tough cleaning, de-scaling and de-rusting jobs. Air operated reciprocating needles adjust to contours automatically. Three sizes. Comes in handy kit with accessories.—MARINDUS COMPANY.

38—Heavy-Duty Wrench Set—Bulletin 8141-C details the Loxocket 521-EHD-B. Metal case containing 17 sockets from 1-7/16" to 3⅛", ratchet, sliding bar and two extensions — 8" and 16" — ready to go on any assignment. — SNAP-ON TOOLS CORPORATION.

50—Industrial Weed Problems? — Any man can weed-proof 10,000 sq ft in ten minutes with Ureabor — the dry granular weed-killer. You only use 1 to 2 lb per 100 sq ft. Folders give details on long-lasting control and your nearest distributor. — UNITED STATES BORAX & CHEMICAL CORP.

51—Chimney Protection—New non-asphaltic, spray applied coating for use in concrete, steel, and brick chimneys inhibits corrosion from acid exhaust gases. Customer field tests rate STACKFAS outstanding on heat, acid and fly ash abrasion resistance. — BENJAMIN FOSTER COMPANY.

54—Repair & Maintenance Products—Complete product line shown in use with prices, sizes, weights, colors and styles. All products distributed by Rasco's 11 Southeastern Branches. — REYNOLDS ALUMINUM SUPPLY CO.

55 — Better Tube Maintenance — Catalogs describe how line of air-powered tools and accessories (condenser cleaners, tube cutters, expanding brush head cleaners, etc.), are job-fitted to specific tube repair operations. — AIRETOOL MANUFACTURING COMPANY.

57—Maintenance Painting — The Porter Manual makes it easy for you to do the right thing with your paint maintenance dollar. Details Planning, Surface Preparation, Application, Film Thickness, Classification of Surfaces, Abrasion Resistant and Heat Resistant Finishes and Fungus Control. — PORTER PAINT CO.

64—Anti-Corrosive Paints—Bulletin, "The Application of Subox and Subalox Paints," gives the story of a complete paint system for weather, moisture and alkali protection, with details as to application.—SUBOX, INC.

66—Tube Expanding—Bulletin 55 on torque control describes automatic air driven tube expander drive. Control assures uniformity of tube expanding. — THOMAS C. WILSON, INC.

75—Storage Racks — How you can build them faster with Kee Klamp slip-on fittings described in Catalog K-25-D. Allen wrench only tool needed. Simple to erect; easy to dismantle. 58 varieties for pipe sizes ⅜" to 2".—KEE KLAMPS NORTH AMERICA, LTD.

77 — Plant Health Aid — Automatic footsprayer dispenses skin-toughening solution for prevention of athlete's foot. One gal of solution sufficient for 3,000 treatments. Catalog S-12 gives details.—ONOX, INC.

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78 — Control Heat & Glare — New folder tells how Sun-X Glass Tinting (transparent alkyd-based liquid plastic by DuPont) is applied directly to existing glass by flow process without spray or splatter. Bonds tightly. Wash in usual manner.—AMERICAN GLASS TINTING CORP.

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801—Motors—Bulletin describes and catalogs more popular a-c motors from 1 to 600 hp, for every process and manufacturing requirement. Single phase and polyphase; surpass NEMA specifications. — BROOK MOTOR CORP.

802—Low-Peak Fuses — New fuses that safely interrupt fault currents up to 200,000 amp described in Bulletin LPS. Protect mains, feeders, branch circuits, switches. Limit fault current to very low values. Hold 500% load for minimum of ten seconds. Available in N.E.C. sizes from 15 to 600 amp in both 250 and 600 volt ranges.—BUSSMANN MFG. DIV.

803—Power Control — Bulletin describes design, manufacturing and consulting services for motor control centers; switchgear; power centers; specialty, mechanical and automation control requirements.—POWER CONTROL COMPANY.

807—Motor Bearings — Catalog 258 gives complete listing of cast bronze motor bearings for all makes and sizes.—THE BUNTING BRASS AND BRONZE COMPANY.

813—600-Volt Wiring—How Anaconda Densheath 900 offers long life, high heat and moisture resistance, chemical stability and easy installation is described in Bulletin DM-5612 —ANACONDA WIRE & CABLE CO.

816—High Voltage Protection — 36 page catalog of linemen's protective equipment describes products for utility and industrial electrical fields. — CHARLESTON RUBBER COMPANY.

822—Hi-Temp Industrial Wire—Densheath 900's multiple ratings for 6 applications outlined in Catalog DM6030. Exceptionally stable against heat, chemicals, oils, and moisture. 100% water tested at factory. Use it as industrial, machine tool, appliance, control, switchboard, or building wire.—ANACONDA WIRE AND CABLE COMPANY.

871—Electrical Protection — Handbook tells how to select protective devices for circuits, motors and apparatus. Condenses all '59 Code references covering protection problems. Explains how installation costs can be cut and space saved with Dual-Element fuses. — BUSSMANN MFG. DIV.

874—High Voltage Rubber Cables — 32 page catalog contains information on design features, insulations available, and performance highlights of company's butyl rubber power cable, Durasheath. Also data on kinds of available constructions from 600 v to 15,000 v conductors.—ANACONDA WIRE & CABLE CO.

877—Motor & Commutator Maintenance — Line of resurfacers, flexible abrasives, grinders, brush seaters, undercutters and other tools described in Motor Maintenance Products catalog. — IDEAL INDUSTRIES, INC.

880—Electrical Test Kit — Amprobe literature describes Test-Master Kit — all equipment you need for electrical testing jobs. — PYRAMID INSTRUMENT CORP.

885—Electrical Maintenance — File 21 tells how to set up good electrical testing program — insulation resistance testing, motor and phase testing, cable fault location. — JAMES G. BIDDLE CO.

FANS—PUMPS—COMPRESSORS HEATERS—HEAT EXCHANGERS

100—Power Plant Pumps — Bulletin BJP 58-8 covers complete line of standard pumps for power plant requirements — from 12,000 hp, doublecase boiler feed pump, to condensate, circulating and booster pumping duty. Also, special pumps for nuclear power plant installation. — BYRON JACKSON PUMPS, INC.

122—Industrial Fans — Bulletin 702 covers Type XL fans for air and material handling. Volumes to 130,000 cfm pressures to 18" SP. Catalog 855 describes Pressure Fans. Volumes to 12,000 cfm, 10" to 50" SP. — CLARAGE FAN CO.

135—Air Cooled Heat Exchanger — Bulletin 132 describes air-cooled unit to solve the problem of water supply and disposal, cooling fluids or condensing vapors, removing heat at rate of input for close control of temperature. All parts of unit always accessible for easy maintenance with cleanable coils. Replaces both cooling tower and surface condenser. — NIAGARA BLOWER COMPANY.

143 — Chemical Feeders — 36 page Bul. 1136 describes metering pumps — types, construction, displacement and operating pressures. Gives handling recommendations for chemicals, acids, etc., and volumetric conversion tables. — MANZEL.

154—Chemical Feeders — Bulletin 202, 4 pages, illustrates and describes the Ful-O-Feeder chemical system for continuous heavy duty service. — FULBRIGHT LABORATORIES, INC.

160—Boiler Feed Pumps — 12 page Bulletin 122 describes and illustrates the type BFI high pressure pumps. Design features, service ratings and engineering data included. —PACIFIC PUMPS, INC., a Division of Dresser Industries, Inc.

163—Storage Water Heaters — Gas fired, Scalefree 230 units described in Bulletin 4. Fully automatic package requires only simple connections. Available in more than 100 storage and recovery combinations ranging from 250-4,000 gal. — THE PATTERSON-KELLEY CO.

170 — Pumping Problems? — Two stage, Type JC pump will meet requirements up to 650 gpm. Horizontally split casing top can be taken off quickly for inspection and rotating parts removed and replaced without disturbing piping, connections, fittings or driver. — THE WEINMAN PUMP MFG. CO.

INSTRUMENTS—METERS CONTROLS—REGULATORS

205—Draft Gages — Bulletins describe inclined, vertical tube, air filter gages, straight line and dial pointer type, minified draft and receiver type gages, velocity gages and pitot tubes, gas analyzers and steam calorimeters. — ELLISON DRAFT GAGE CO., INC.

207—Control Centers & Systems — Combustion safeguard and automation packaged control centers insure full coordination of complete system, place responsibility on one source, insure correct wiring, and reduce field labor. Catalog C11 illustrates variety of designs and circuits now in use. — WEBSTER ENGINEERING CO.

212—Self-Powered Controls—Bulletin 620 describes self-powered automatic temperature regulators — no compressed air or electrical wiring required, no delicate mechanisms to adjust, no packing glands to stick, no shut-down due to power failure. —SARCO COMPANY, INC.

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222—Pressure Regulators — Catalog No. 77 illustrates and describes application, operation and specifications for a complete line of reducing, back-pressure and pump-pressure regulators.—MASON-NEILAN.

234—Soot Blowing Control Systems —Bulletin 1029, 16 pages, gives complete engineering description and illustrations of Selective-Sequence and Automatic-Sequential insert type panel controllers. List of typical installations shows wide variety of applications. — COPES-VULCAN DIVISION.

Bulletins (Cont.)

241—Liquid Level Controllers—Catalog No. 405 illustrates and includes technical, instructive and descriptive information on the 12,000 Series variable-displacement type controllers. — MASON-NEILAN.

252—Water Columns, Gauges, Equipment — Brochure AO — Introduction to low pressure (0 to 250 psi) division of catalog data. Explains principles and construction of Reliance low pressure alarm water columns, and lists accessory equipment. — RELIANCE GAUGE COLUMN CO.

253—Combustion Analyzer—4 page Specification E65-5 describes the "Heat Prover" which indicates per cent by volume oxygen and combustibles present in exhaust gases from all types of boiler and industrial furnaces. — BAILEY METER CO.

267—Remote Liquid Level Indicators—Bulletin RI-1825 describes indicators for pressures up to 3000 psi — advantages, operation and specific installations. — YARNALL-WARING COMPANY.

PLANT CONSTRUCTION—WELDING EQUIPMENT—SPECIALTIES

300—Buyer's Guide—Up-to-date industrial and maintenance building products stock list. Includes complete listing of all Rasco distributed products plus branch locations. — REYNOLDS ALUMINUM SUPPLY CO.

306—Steel Buildings — Shed roof, gable roof frameless and gable roof rigid frame units described in Catalog SX-13757. 5,000 sizes available to meet all space needs. — ARMCO DRAINAGE & METAL PRODUCTS, INC.

309—Fiberglass Panels having 20-year guarantee on panel color and light transmission characteristics are lowest-cost glazing you can buy on cost-per-year basis. Stylux-20 is shatterproof; provides up to 90% light transmission; does not pit or erode. Use for windows, skylights, sun shades, etc.—BUTLER MANUFACTURING COMPANY.

310 — Incinerator — Metal cased, insulated, refractory lined incinerators for industrial and commercial use. City smoke code approved. Fast, economical installation — any size and capacity. — NORTH STATE PYROPHYLLITE CO., INC.

315—Pressure Vessels — Catalog 100 discusses plate fabrication problems and shows how company custom-fabricates hot water storage heaters, tanks, air receivers, blow-off tanks. Corrosion resistant linings and materials featured. Suggested specifications and other valuable technical data given.—J. J. FINNIGAN CO., INC.

332—Heat Transfer Equipment — If you have material to liquefy, heat, vaporize, superheat, condense, cool or solidify, check Bulletin HE-8 describing exchangers designed for temperatures as low as minus 160 F and as high as 1600 F with pressures ranging from vacuum to 9500 psi. — HENRY VOGT MACHINE CO.

335—Classifying Systems — Bulletin explains general operating characteristics of centrifugal and gravitational type classifiers. Curves illustrate high efficiencies achieved in actual installations and indicate particle size distribution on incoming feed, separated fines and coarse material. — BUELL ENGINEERING CO., INC.

370—Industrial Fence — You can eliminate pilferage, control traffic, and improve plant appearance most economically with Anchor Chain Link Fences. Catalog gives case studies from other plants in South-Southwest. — ANCHOR FENCE.

386—Rigid Frame Buildings—8 page bulletin "Dixisteel Rigid Frame Buildings" — low cost, flexibility of design, durability, and minimum maintenance; also triangular or bow-string truss all-steel roof systems; fabricated for rapid erection. — ATLANTIC STEEL COMPANY.

390—Tank Insulation — An uninsulated tank is like a giant radiator heating the outdoors — and that costs money. 8-page Ultralite Tank Brochure tells you how you can save over 90% of this heat loss with glass fiber blankets. Can pay for itself in six months to a year. — GUSTIN-BACON MFG. CO.

PIPING—VALVES—FITTINGS STEAM SPECIALTIES—TRAPS

410—Flexible Connectors—How all-metal connectors absorb piping vibration described in Catalog 1D-100C. Convey corrosives, simplify misaligned hookups, and save installation time. Bronze, carbon steel and stainless steel. — UNIVERSAL METAL HOSE CO.

414—Acid Resistant Pipe — 4 page technical brochure covers properties of Union 20-S stainless steel. Alloy can be welded and put into service without subsequent annealing. Shows comparative resistance to 94 different corrosive agents. — REYNOLDS ALUMINUM SUPPLY CO.-UNION STEEL CORP.

415—Steam Trap—Bulletin No. 455-B describes the Float-Thermostatic steam trap with its entire operating element in one unit making it removable without disturbing inlet and outlet connection to the semi-steel trap body, suitable for 125 psi steam pressure.—SARCO COMPANY, INC.

416—Control Valves—Illustrated Cat. 305 contains detailed specifications on air-operated control valves. All usual types are described. Technical data are included as an aid to selection.—MASON-NEILAN DIV.

417—Welding Fittings—Seamless and welded fittings featured in Bulletin 60-C. Features industry's most complete line of directional changes, branch connections, flanges and special types. — MIDWEST PIPING COMPANY.

420—Valves—24 page catalog illustrates and describes bronze, iron, steel and corrosion-resistant valves for controlling the flow of water, oil, gas, steam and corrosive fluids. — THE WM. POWELL CO.

421—Air and Gas Traps—8 page Bulletin No. 289 describes complete line of ball float traps for draining water from air, gas or steam lines or draining a light liquid from a gas under pressure (for pressures to 900 lb). Includes: installation, selection and ordering information. — ARMSTRONG MACHINE WORKS.

429—Expansion Joints—Advantages of the Gun-Pakt expansion joint described in Bulletin EJ-1917. No shutdowns for repacking. Installational suggestions. — YARNALL-WARING COMPANY.

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463—Stainless Steel Valves—Catalog 59 SS describes line of gate, globe and swing check valves with details of valve patterns in alloys that satisfy requirements of most corrosive services. Includes section to show degree of resistance of alloys to many corrosive media under varying conditions.—JENKINS BROS.

465—Water Hammer—Cause, effect and control covered in Bulletin 851.—THE WILLIAMS GAUGE CO., INC.

468—Steam Traps — 40 page engineering manual aids engineers and maintenance men in sizing, specifying and buying of steam traps and other fluid specialties. All data necessary to engineer a trap installation is included.—V. D. ANDERSON CO.

487—Power & Process Piping—Offering single responsibility, specialized service, integrated facilities for all piping, Catalog 60B highlights erection, fabrication and welding fittings details. Case studies from the South-Southwest.—MIDWEST PIPING COMPANY.

488—Power Piping Field Erection — Increased importance of piping erection proficiency is stressed in new 12 page brochure. Tells how field erection costs and quality are controlled and discusses welding and other technical aspects.—THE M. W. KELLOGG COMPANY.

BOILERS—STOKERS BURNERS—FUELS

501—Packaged Steam Generators — DK units described in bulletin: 24 sizes for gas, oil or combination firing in capacities up to 60,000 lb/hr, with design pressures up to 600 psi. Special package boilers up to 100,000 lb/hr and field erected units up to 200,000 lb/hr for all fuels and all types of firing are featured. — E. KEELER COMPANY.

504—Steam or Hot Water for power, process or heat highlighted in 20 page Catalog AA-2. 20 through 600 hp units, fuel burning equipment and controls, service data, and available outdoor type enclosures detailed—AMES IRON WORKS, INC.

516—Fuel Savings—How the packaged Ljungstrom air preheater boosts performance and offers fuel savings for small boilers and process applications is highlighted in 14 page Bulletin. Boiler as small as 25,000 lb/hr can have advantages of regenerative preheating — saves fuel, boosts output, and permits use of lower grade fuels.—THE AIR PREHEATER CORPORATION.

519—Feedwater Deoxygenation — 12 page Bulletin BW-7 describes advantages of chemical deoxygenation of boiler feedwater with an aqueous solution of Hydrazine. Covers in detail the properties and action of Hydrazine in maintaining boilers as well as recommended methods of application. — FAIRMOUNT CHEMICAL CO., INC.

531—Fuel Oil Treatment—Data sheet describes how Mogul treatment disintegrates, dissolves and disperses sludge in fuel oil storage tanks and equipment. Through sludge dispersal, maximum vaporization and combustion are possible.—THE NORTH AMERICAN MOGUL PRODUCTS COMPANY.

535—Unit Steam Boilers — Catalog AD-100 — Gives complete information on oil and gas fired "Self Contained" boilers, 15 to 500 hp, 15 to 250 psi for processing and for heating. Gives features, applications, efficiencies, capacities and dimensions.—CLEAVER-BROOKS CO.

536—Automatic Boiler-Burner Unit —Assembled plant (Scotch-type, two-pass) for all heat or power applications, low pressure or high pressure; burner to match for heavy oil, light oil, or combinations of gas/light or gas/heavy oil. Easy maintenance. Bulletin SPI-100 gives details.—INDUSTRIAL COMBUSTION, INC.

537—Waste Heat Boilers—Economical utilization of excess heat from diesel exhaust gases and from industrial and chemical processes described in Bulletin WHB-47-4. Bare tube and extended surface designs of varying capacities and applications covered. — FOSTER WHEELER CORPORATION.

552—RotoStoker—Cat. 860 describes overthrow spreader type stoker with power or hand operated dumping grates or stationary grates. Burns all grades of bituminous or lignite coals, many refuse fuels—DETROIT STOKER CO.

577—Combustion Control — 12 page Bulletin 510 illustrates and describes how company's combustion control systems are applied to four major makes of pulverized coal-fired boilers.—BAILEY METER CO.

587—Coal-Fired Packaged Boiler — The new semi-automatic stoker-fired unit available in standard sizes of 43,000, 50,000 and 63,000 lb/hr, described in Bulletin PG-59-4. Performance characteristics, line drawings, and photos included. — FOSTER WHEELER CORPORATION.

591—Steam Generators — 18 sizes, from 20 to 600 bhp, for pressures to 250 psi, also for hot water. Complete details in Catalog 811F. — SUPERIOR COMBUSTION INDUSTRIES, INC.

ENGINES—DRIVES POWER TRANSMISSION MATERIAL HANDLING

605—Cranes & Hoists — Production moves faster, more efficiently and you increase usable storage space with Job-Mated cranes and hoists. Bulletin gives the right com-

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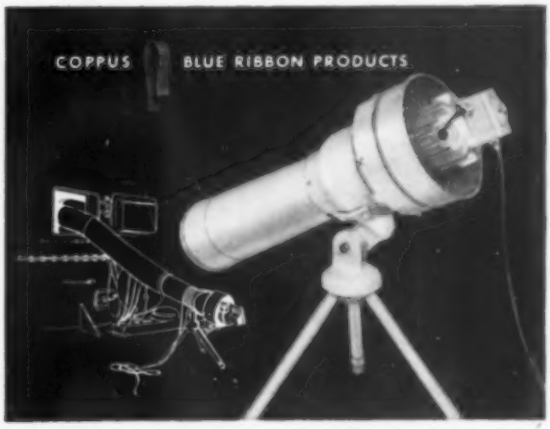

COPPUS "Blue Ribbon" Vane Ventilators are portable and easily adaptable to practically any "fresh-air" requirement in industry. Mail coupon below for facts.

COPPUS ENGINEERING CORP.
261 Park Avenue, Worcester 10, Mass.

- ☐ in tanks, tank cars
- ☐ in underground manholes
- ☐ for exhausting welding fumes
- ☐ on boiler repair jobs
- ☐ for general man cooling
- ☐ to stir up stagnant air wherever men are working or material is drying

Name .....
Company .....
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City .....

COPPUS BLOWERS

Bulletins (Cont.)

bination of capacity, clearance, speed, controls and components to handle each job best. — SHEPARD NILES CRANE AND HOIST CORP.

614—Vertical Transportation — Catlog A-382 describes and illustrates details of passenger and freight elevators and escalators, for use in all types of industrial plants. —OTIS ELEVATOR CO.

616 — Gas Fork Trucks — Extremely maneuverable, easy-to-operate trucks described in catalog. Standard full capacity lifts up to 144" — higher lifts available. — BAKER INDUSTRIAL TRUCKS DIV.

618—Casters & Wheels—Featuring "Lockweld" steel casters without a king-pin, Cat. C-57 describes full line of industrial wheels manufactured and distributed from Rome, Ga. plant.—THE FAIRBANKS CO.

627—Variable Speed Fluid Drives for blowers, fans, pumps, compressors, etc., detailed in 20 page Bulletin A-719. Features of the Gyrol fluid drive include no load starting, power savings, simpler and better control. — AMERICAN-STANDARD INDUSTRIAL DIVISION.

641—Belt Conveyors — Cat. ID-591, 88 pages, shows principal belt conveyor products, including heavy duty and standard roller bearing and precision ball bearing idlers. Engineering data section contains simplified information for proper selection. — CONTINENTAL CONVEYOR & EQUIPMENT CO.

WATER TREATMENT—HEATING & AIR CONDITIONING—DUST & FUME CONTROL—REFRIGERATION

700—Peak Load Problems? — Keep your air conditioning and refrigeration systems operating at maximum efficiency during peak load months. Catalog tells how Anco treatment removes rust and scale and kills slime and algae in equipment. — ANDERSON CHEMICAL COMPANY.

702—Water Conditioning — Bulletin 611C, 20 pages, describes manual and automatic softeners, zeolites and ion exchange resins, mixed-bed and multi-column deionizers, dealkalizers, ion exchange systems, filters and purifiers, and water treating chemicals. — ELGIN SOFTENER CORPORATION.

706—Centrifugal Blowers & Exhausters — Catalog ACB-104 covers units providing uniform air pressure up to 10 psi, or vacuum up to 12-in. of mercury. Volumes to 20,000 cfm. Line provides clean, dry air or gas at constant pressure for many processes. — U. S. HOFFMAN MACHINERY CORPORATION.

09—Purer Process Water—Data tells how Ferri-Floc (ferric sulfate) can help with coagulation and softening, removal of iron and manganese and other water purification problems. — TENNESSEE CORPORATION.

715—Amine Treatment—Return line corrosion is a critical problem in maintaining economical, efficient power plant operation. Bulletin CP-100 shows how amine treatment is an easy, effective and economical way to eliminate pipe corrosion problems. — THE BIRD ARCHER COMPANY.

716—Dust Collection—Whether nuisance elimination or process material recovery, check on Whirlex Dust Collector Units. Engineering data available. — THE FLY ASH ARRESTOR CORP.

724—Chemicals & Services — Water treatment chemicals and engineering services for The Industrial South-Southwest highlighted in 12 page Bulletin 5000-A. Specific products and their functions detailed.—DEARBORN CHEMICAL COMPANY.

733—Air Handlers—Technical bulletins describe air handling units 665-47,000 cfm capacity. — ACME INDUSTRIES, INC.

739—Air Engineering—8 page Bulletin 135 illustrates and describes air engineering apparatus for process industries. Includes after-coolers, air conditioners, liquid coolers, heat exchangers, condensers, refrigeration equipment. — NIAGARA BLOWER CO.

743—Compressor & Engine Filters—Bulletin 310-6, 4 pages, contains information on air filters for compressors and engines, designed to eliminate costs and delays of forced shut-downs caused by dust concentration. — COPPUS ENGINEERING CORP.

748—Stop Fungal Decay — Bulletin MT-58 describes preservative wood treatment for cooling towers, pinpoints organisms that destroy effective performance and prescribes treatment that arrests these destructive organisms, as well as the application techniques.—THE MARLEY COMPANY.

751—Chemical Service—Water conditioning products, equipment and services highlighted in literature —boiler feedwater treatment, cooling water treatment, corrosion inhibitors, fuel oil additives, coagulants, cation resin cleaners. — Chemical Service Dept., THE PERMUTIT COMPANY.

752—Automatic Water Control — 4 page bulletin describes Chemtrol, the new automatic control for treatment of cooling tower water. Adaptable to any size unit, in any location, and to any type water, it controls pH, prevents scale, controls corrosion and eliminates algae — all simultaneously, completely automatically and economically. — WATER SERVICES INC.

756—Refrigeration Problems?—VMC compressors, intercoolers, chillers, described in Bulletin 817—design improvements, protective devices and factory-run-in-tests.—THE VILTER MANUFACTURING COMPANY.

757—Boiler Water Treatment—Data sheets P-101 through P-107 summarize products and their application. — FULBRIGHT LABORATORIES, INC.

Late Bulletins

Q-1—Electric Tools—Catalog No. 62, 32 pages, presents an analysis of complete line of high frequency tools and advantages for specific job applications.—THOR POWER TOOL COMPANY, 175 N. State St., Aurora, Ill.

Q-2—Packings & Gaskets—General Catalog, 40 pages, includes self-lubricating packings; fabric, foil, plastic and filament packings; molded packings; gasketing and gaskets. —GREENE, TWEED & CO., North Wales, Pa.

Q-3—Load Handling Equipment — Bulletin 15025-IC-59, 20 pages, catalogs electric, air, and hand operated chain hoists: lever hoists; cable type hoists; and many hoisting accessories.—MANNING, MAXWELL & MOORE, INC., Muskegon, Mich.

Q-4—Power Tools—Form F-14875, 68 pages, contains over 200 illustrations, information and specifications on Skil and Skilsaw power tools, as well as tool accessories for plant maintenance.—SKIL CORPORATION, 5033 N. Elston Ave., Chicago 30, Ill.

Q-5—Drainline—Bulletin PE-30, 16 pages, lists advantages of corrosion-resistant glass system for disposal of chemical wastes, with details on the Pyrex Brand "double-tough" drainline. — CORNING GLASS WORKS, Plant Equipment Dept., Corning, N. Y.

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See Pages 85 & 86

Q-6—Building Maintenance — Catalog, 20 sections, over 180 illustrated pages, to help select, specify and order materials for maintenance. — REYNOLDS ALUMINUM SUPPLY CO., 756 W. Peachtree St., Atlanta 8, Ga.

Q-7—Steel Shelving—Catalog 2400, 36 pages, describes boltless T-line shelving, angle shelving, tool storage inserts, drawer case units, bin units, and related equipment.—PENCO DIVISION, Alan Wood Steel Co., 200 Brower Ave., Oaks, Pa.

Q-8—Industrial Scales — Booklet, 8 pages, outlines causes of scale error and elimination through proper maintenance; covers equipment, training, and costs involved. — HOWE SCALE COMPANY, Rutland, Vermont.

Q-9—Stop Nuts—ESNA Design Manual No. 101, 18 pages, recommends installation torque values for UNC and UNF hex type Elastic Stop Nuts, with tables of pertinent data. —ELASTIC STOP NUT CORP. OF AMERICA, 2330 Vauxhall Rd., Union, N. J.

Q-10—Elevator Maintenance—Booklet, 24 pages, suggests a preventive maintenance program to safeguard plant elevator service at economical cost.—OTIS ELEVATOR COMPANY, 260 Eleventh Ave., New York 1, N. Y.

Q-11—Powdered Acid Cleaner—Bulletin, HSP-940, 4 pages, covers powdered acid cleaner for removing scale deposits in heat exchangers, boilers, condensers, and other applications.—HAGAN CHEMICALS & CONTROLS, INC., Hagan Bldg., Pittsburgh 30, Pa.

Q-12—Electrode Selection—Bulletin 7300.2, 12 pages, gives physical properties, structure, and welding characteristics of different types of stainless steel as a guide in arc welding. — THE LINCOLN ELECTRIC COMPANY, Cleveland 17, Ohio.

FLEXIDIZE

YOUR RIGID PIPELINE CONNECTIONS

Standard
ALLFLEX MNH
flexible pipe connectors

FROM STOCK IN **STAINLESS STEEL MONEL • BRONZE**

solve your pipeline flexation problem!

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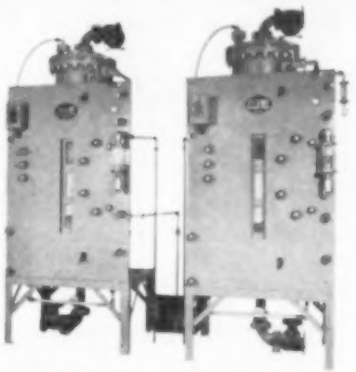
ILLCO-WAY DESIGNERS AND BUILDERS

MODERN EQUIPMENT FOR ionXchange

HIGH FLOW RATE
CONDENSATE SCAVENGERS



FOR CONVENTIONAL POWER PLANTS

You may know that some of the new, fantastic, super-critical, once-through power plant boilers use elaborate condensate-scavenging demineralizers. Since 1951, however, IWT has supplied *less complex* but highly effective and economical de-ionizers for condensate scavenging to various "conventional" power plants. These operate on a by-pass system, de-ionizing a portion of the total condensate stream, to produce a marked improvement in conductivity and silica in the boiler water and a corresponding reduction in costly blowdown. Initial investment and operating costs are modest.

"PACKAGED" FOR EASY INSTALLATION

The picture above shows a typical twin-condensate-scavenger installation consisting of parallel Mixed-Bed De-Ionizers. Each of these units is shipped fully-assembled, as a complete "package," with the tank, piping, valves and instruments all installed, connected, and tested. The tank is filled with resin and the unit is ready to operate. (U.S. Patents 2,605,084 and 2,771,424.)

CALL YOUR IWT MAN

Your nearest IWT Representative is equipped by experience to advise you well not only in the possible applications of these condensate scavengers, but also with respect to many other water-treatment problems.

ILLINOIS WATER TREATMENT CO.
840 CEDAR ST., ROCKFORD, ILLINOIS
NEW YORK OFFICE: 141 E. 44th St., New York 17, N.Y.
CANADIAN DIST.: Pumps & Softeners, Ltd., London, Ont.

NEW Product Briefs

. . . there is always a BETTER WAY

FOR MORE INFORMATION ON FOLLOWING ITEMS
Fill in Code Number on Return Card — Page 85

Impact Wrench

E–1 A completely new type design, lightweight, pneumatically operated Impact Wrench has been perfected by **The Airetool Manufacturing Company,** 302 South Center St., Springfield, Ohio. The models 625 and 626 heavy

duty ½" bolt capacity wrenches are built to withstand the abuse of high production.

The impact mechanism of the wrench does not rely on springs or centrifugal force for operation. A high run-down speed is incorporated in the wrench, which operates on low air consumption. Another important feature is that the tool is reversible. The Model 625 is furnished with a ½" drive square, while the Model 626 is furnished with a ⅝" drive square.

Leak Detector

E–2 "Snoop," a new liquid leak detector, is announced by **Nuclear Products Company,** 15636 Saranac Road, Cleveland 10, Ohio. The product has a fine bubbling action that detects leaks in

pressurized air or gas lines.

A thin, solid stream of Snoop is applied to test each connection. Bubbles form immediately if a leak is present. The solid stream method of application avoids bubble formation from spraying which has been the case in the past. Long bubble life and positive leak indication of minute leaks are special features of Snoop. It will even detect leaks at the bottom of connections in vertical runs where gravity tends to remove testing fluid.

Turbine Insulation

E–3 **Keasbey & Mattison Co.,** Ambler, Pa., is now offering Sprayed Limpet Asbestos. According to the manufacturer, by spraying the asbestos thermal insulation onto the exhaust fan housing of a new 20,600-kw gas tur-

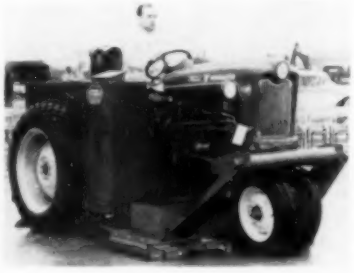
bine, applicators cut, by a quarter, the time required for applying thermal insulation by conventional methods.

The Limpet insulation was sprayed dry, from the center orifice of a special multi-orificed spray-gun. The fibers mixed, about 9 in. in front of the gun, with water jets sprayed simultaneously from peripheral orifices in the gun, and the mixture "hit the target" as a permanently adhering insulating blanket.

A special spraying machine, that cards the asbestos fibers into an even-spraying consistency, fed the material through a 2-in. spray hose, from the main floor to spraying sites on the balcony level.

Floor Scrubber

E–4 **Lincoln Floor Machinery Co.,** division of American-Lincoln Corporation, Toledo 3, Ohio, has announced the development of a gasoline powered



Scrubmobile that is said to outperform the cleaning action and coverage of a hundred men using manual methods to clean large floor areas.

The Model 772 automatic floor scrubber washes, picks up scrub water and vacuum-drys the floor in a single automatic operation. It is designed for use at industrial plants, airports, warehouses, large auditoriums and parking lots. Four free-floating 18" wide brushes scrub a path six feet wide at the rate of 3½ miles per hour. On unobstructed floor area this means a scrubbing capacity of 182,000 sq ft per hour. All the operator does is

steer the Scrubmobile tractor and occasionally pull a lever.

Gasket Cutter

E–5 A hand-type gasket cutter which permits an interlocked joint for improved sealing of power tranformers in the field is available from the **Westinghouse Electric Corporation**, P. O. Box 2099, Pittsburgh 30, Pa.

The gasket cutter — which has a steel keystone-shaped blade — cuts mating interlocked joints, thus preventing slippage. Furthermore, the new cutter eliminates scarfing gaskets and cutting special shapes. It can be used for making joints in gaskets from ¾ to 3 inches wide and up to ½ inch thick.

Service Ladder

E–6 **Aluminum Ladder Company**, Special Ladder Dept., 63 W. Darlington St. Ext., Florence, South Carolina, is offering the new Alco-Lite rolling service ladder, a completely self-supporting extension ladder unit requiring no secondary support. The ladder is mounted on a rigid, welded steel frame that is equipped with 8" semi-pneumatic wheels and hand-retractable, swivel type front casters. The large rear wheels move freely over rough floors and allow the unit to be guided easily.

With the ladder in a horizontal position, the overall dimensions of the entire unit are a compact 30" x 70", which can be moved through standard doorways and narrow aisles. A cam operated device locks steel rods into the bottom gusset-plate rung openings to hold the ladder securely in the upright position. Outriggers, which fold out of the way when not in use, extend to both sides to provide added side stability when needed. Hand rails and a lineman's plastic belt attached to the top of the ladder are added safety features. A 24 ft or 28 ft Alco-Lite heavy duty all-aluminum or fiberglass extension ladder can be specified on this unit.

Floor Patch Material

E–7 A new and improved floor patch material has been announced by **Ranco Industrial Products Corp.**, 13311 Union Ave., Cleveland 20, Ohio.

This product is "Magic Floor," and it is claimed that heavy duty industrial floors of concrete, wood, wood block, brick, and steel can be patched within minutes and immediately open to traffic without mixing, troweling, or drying time.

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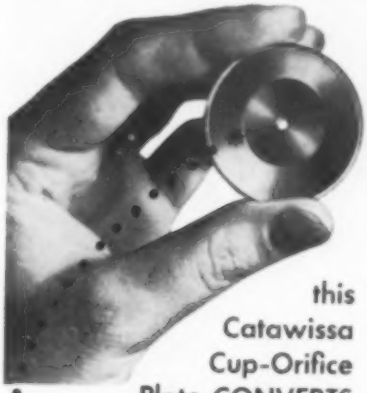
Magnetic Sweeper

E–8 A low-cost, multi-purpose, rotary, non-electric magnetic sweeper which promotes plant safety and good housekeeping is available from **Eriez Manufacturing Co.**, Erie 6, Pa.

Called Sweeperette, the maintenance-free, lightweight, hand-propelled sweeper is used to clear factory areas of dangerous ferrous

here's real **ECONOMY...**
time-saving **SIMPLICITY...**
and sure-fire **DEPENDABILITY**
for metering, measuring, controlling any piped material!



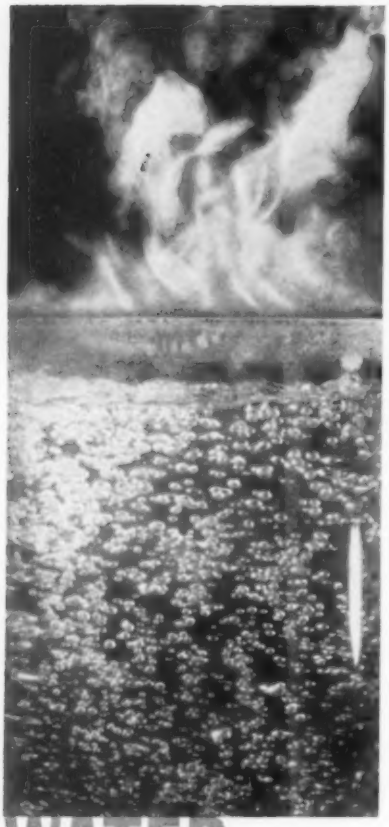
this Catawissa Cup-Orifice Plate CONVERTS any standard Catawissa Union into a ***GASKETLESS*** **ORIFICE UNION**

ELIMINATES the necessity of expensive gaskets...the uncertainty of what type gaskets are needed for specific temperature and pressure requirements... fumbling with extra parts!!!

Orifice Union problems of the past are gone forever! Stainless or carbon steel cup-orifice plate fits easily, quickly, securely to form a good, tight, leakproof seal. Temperature and pressure requirements are restricted only by the rating of the union itself (3000-lb. service, 9000-lb. test)!

Just specify "Catawissa Cup-Orifice Plates" or "Catawissa Cup-Orifice Unions" at your favorite supply store—or write for catalog and complete information.

CATAWISSA VALVE & FITTINGS CO.
CATAWISSA • PENNSYLVANIA



WATER
FOR BOILERS
NEEDS
DEOXY-SOL

- to remove O_2
- reduce oxides
- raise pH

Fairmount DEOXY-SOL, a solution of hydrazine, is a high efficiency oxygen scavenger designed especially for high pressure boiler water treatment.

DEOXY-SOL removes oxygen, reduces oxides and raises pH of the condensate all at the same time . . . yet adds no solids.

Stocks in Newark, N. J., Chicago, Ill., Los Angeles, Calif. Investigate its advantages for your system. Write for Bulletin BW.

Fairmount
CHEMICAL CO., INC.
136 Liberty St., New York 6, N. Y.

contaminants including sharp metal chips, filings, nails and tacks. Sweeperette's powerful permanent magnetic tube picks up ferrous contaminants along its entire length to a depth of ¾ inches. Unloading the magnetic tube is accomplished by removing it from the unit and clearing ferrous particles with a neoprene wiper ring. The Sweeperette is available direct from the factory at prices starting at $34.50.

Small Tube Expander

E–9 **The Airetool Manufacturing Company,** 302 S. Center St., Springfield, Ohio, has developed the Model 400-TR tube expander for ferrous and nonferrous tubes from ¼" to ⅜".

The pneumatic motor tool is available at 1700 or 2400 rpm, and can expand 30 or more tubes per minute. Weighing only 2¾ lb, the motor is hand held for instant trigger control.

The special size condenser and heat exchanger tube expanders produce a smooth unridged surface in the tube. They give exceptionally long service, and feature a ball bearing thrust collar which eliminates frictional heat. The rolls are tapered to produce uniform expansion and tightness throughout the tube sheet.

Hydraulic Power Pump

E–10 A new miniature size, portable two-speed hydraulic power pump weighing only 14 pounds, yet capable of developing pressures up to 10,000 psi, is announced by **Greenlee Tool Co.,** Rockford, Ill.

This No. 1729 pump incorporates higher volume, low-pressure pumping features which provide fast approach ram action with automatic change-over to low-volume, high-pressure drive. Approximate pumping capacity is 80 cubic inches at 30 psi, 20 cubic inches at 100 psi, and 4 cubic inches at 10,000 psi. The pump is reported as an ideal power source for electricians' hydraulic knockout punch drivers, rams, jacks, pullers, and other tools or hydraulic systems where high-pressure, low-volume requirements are similar.

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Rubber Lining

E–11 A hardy, new industrial rubber lining material that cold-bonds itself to metal and other surfaces with field-applied cement has been developed by **The Goodyear Tire & Rubber Company,** Industrial Products Div., Akron 16, Ohio.

When utilized in countless industrial applications, the natural rubber covering — Jade Green Armabond — will provide protection against impinging abrasion and chemical action of most inorganic salts, alkalis and acids, the company said. The new material is designed to protect interior surfaces of chutes, mills, cyclone collectors, shot and sand blast machinery and other equipment. It also is suitable for "recapping" conveyor belts. Through its specially compounded tie-gum backing, the natural rubber lining may be cold-bonded to a wide variety of surfaces, including metal, fabrics and other rubber compounds.

Tile-Like Finish

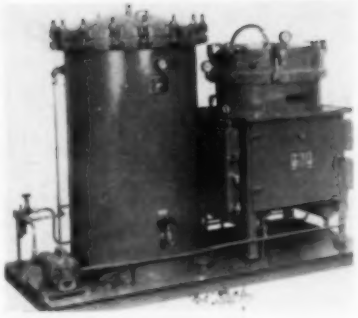
E–12 **Industrial Aids Co.**, Locust Road, Locust, N. J., announces that "Tylike," an exterior or interior finish coating for all types of wall surfaces, is now available in an assortment of colors.

This coating, which has the appearances and characteristics of porcelain tile, is simply applied by roller and needs no special instructions. Waterproof, acid resistant and easily cleaned, it is especially applicable in industrial plants where dustfree conditions are sought.

Filter-Reclaimer

E–13 **The Hilliard Corporation**, 100 W. Fourth St., Elmira, N. Y., announces a new combination oil filter and reclaimer for internal combustion engines, compressors, and related equipment.

The unit consists of a motor pump set for forcing the oil through the Hilco filter, and the oil reclaimer for polishing and removal of moisture and other contamination. The pump is available in practically any capacity required. All or any part of



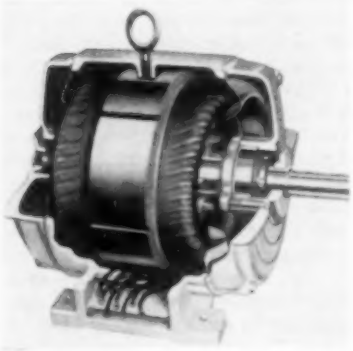
the oil can be diverted to the Hilco reclaimer.

Piping is arranged so that the oil reclaimer or the filter alone can be operated where straight filtration is required, or in combination for removal of volatile material and heavy solids. The unit can be used for restoring practically all types of lubricating oils to new condition.

Capsular Insulation

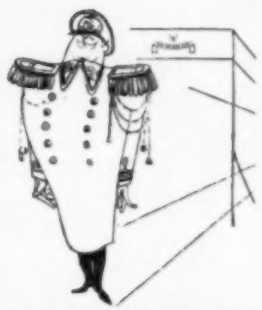
E–14 The "Capsular" Insulation System for encapsulated random wound a-c induction motors has been announced by **The Louis Allis Co.**, 427 E. Stewart St., Milwaukee 1, Wis.

The new encapsulated motors offer added protection against moisture,



chemicals, oils and abrasive contaminants, providing longer life for open motors used in adverse environmental atmospheres.

The encapsulating material has high dielectric strength and exceptional thermal endurance, permitting operation over wide extremes and sudden changes of temperature without cracking, crazing, or breaking of the bond between the plastic compound and stator laminations or windings. The material easily withstands the effects of airborne contaminants drawn into the motor by the ventilating air stream.



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NEW YORK

Salon-size rooms • Terraces • New appointments, newly decorated • New 21" color TV • FM radio • New controlled air conditioning • New extension phones in bathroom • New private cocktail bar • Choice East Side, midtown area • A new concept of service. Prompt, pleasant, unobtrusive.

Single $15 to $22 Suites to $60
Special rates by the month or lease

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MOUNTING GLAND

Eliminated

ON

CHEMPRO

"Wedge-Lock"

mechanical seals

The Chempro line of external "wedge-lock" seals does not require a mounting gland, or any modification to the stuffing box, to align and hold the Chempro seal in position. The patented "wedge-lock" design automatically seats the seal stator in the stuffing box in perfect face-to-face alignment with the seal rotor on the shaft. Simple and easy to install—*in only 20-30 minutes.*

OTHER ADVANTAGES

- Completely Interchangeable with Packing
- Simple in Design—Only 8 Parts
- Chempro Teflon* Shaft Packing—Chemically Inert
- External Seals Adjustable After Installation
- Parts Interchangeable Between Seal Styles
- External and Internal Seals Available—From Vacuum to 100 psi

*du Pont trademark

Write for Bulletins CP551 and 575

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C&EC Co.

Whatever your needs in

Conveying Equipment

call on your Authorized

Continental Conveyor

Distributor FIRST!

Now operating as a largely-employee-owned corporation—no change in brand name, products, personnel or service. Look to Continental Conveyor for continued leadership through 1960 and for years to come!

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CONVEYOR & EQUIPMENT CO.
Winfield Alabama

Sales Offices in: ATLANTA BIRMINGHAM DALLAS HUNTINGTON MEMPHIS NEW YORK

Formerly Industrial Division, Continental Gin Co.

New Product Briefs (Continued)

Airless Spray Pump

E–15 A compact, lightweight airless pump, making the advantages of airless spray available at minimum cost, has been announced by **The DeVilbiss Company**, Toledo 1, Ohio.

The new pump is suitable for industrial maintenance, and for product finishing in many cases. The 17-pound unit is priced at $192.60 F.O.B. Toledo. It consists of lid, five-gallon container, and handle. The 26:1 ratio pump will handle all conventional paints, using the standard airless gun fitted with medium production caps, and will operate with air pressure produced by a compressor as small as 1 hp. According to the manufacturer, a chromium piston in a stainless steel tube operated by a quiet, time-proven air motor insures long, trouble-free service.

Zinc-Filled Coating

E–16 **Truscon Laboratories**, 1700 Caniff, Detroit 11, Mich., announces the marketing of Chem-Zinc, a ready-mixed zinc-filled coating for structural steel, tanks, dam gates, and other on-shore and off-shore installations.

Chem-Zinc cures to an inorganic film. It is a single-application, anti-corrosive coating which provides greater control because there is no chance for improper mixing at the job site. It has unlimited storage life and is self-curing. Minutes after coating it becomes resistant to rain, splash, turbulence and immersion in fresh or salt water. It will not split or separate into thin layers.

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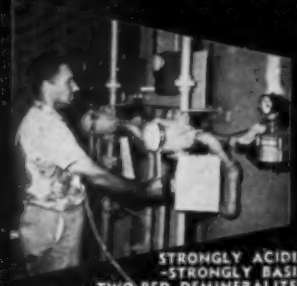
Leak-Stopping Additive

E–17 **Flexrock Company**, 3645 Filbert St., Philadelphia 1, Pa., announces the availability of "Flextite," a liquid chemical additive that makes a fast-acting leak-stopper out of ordinary cement. It regulates the setting of Portland cement, making it possible to stop direct leaks instantly.

Flextite mortar is equally effective as a water-resistant plaster

FOR WATER *Softening* AND *Conditioning*. .



STRONGLY ACIDIC -STRONGLY BASIC TWO-BED DEMINERALIZER

Pictured above is a large heavy duty demineralizer with solo valve manual control, located at a Florida Air Force Base.
One of many demineralizers and water conditioners designed and manufactured by Southern Water Conditioning, Inc.
Write for further data, specifications, bids or surveys.

All types of Domestic, Commercial, and Industrial Water Softening and Conditioning Equipment: Filters - Taste and Odor Removers - Aerators - Demineralizers - Zeolite, Ion Exchange Minerals in stock - Residential and Commercial Package Swimming Pool Filters - Also Rebuilding and Modernizing.

Southern Water Conditioning, Inc.
301 15th Avenue South
St. Petersburg, Florida

coat that seals off seepage and excludes moisture in wet basements or pits. It is excellent for pointing up spalled areas or recoating exposed reinforcing bars or beams. Whether used as a leak-stopper or a plaster coat, the mortar works equally well on concrete, masonry or brick surfaces.

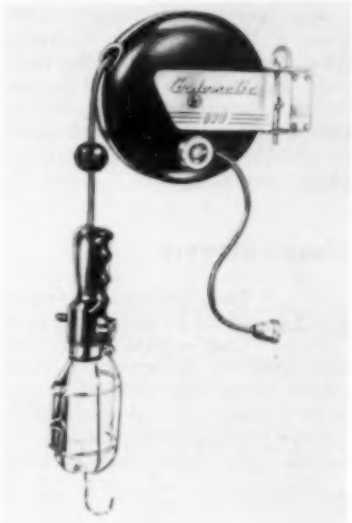
Clad Pipe and Fittings

E–18 A wide-range line of "Penton"-clad pipe and pipe fittings to carry corrosive fluids or withstand corrosive atmospheres is being offered by **York Industrial Plastics, Inc.**, R. D. 5, York, Pa. Schedule 40 steel pipe and cast-iron fittings are clad inside and out with a high-temperature plastic, resistant to most chemicals.

The new piping system combines the strength of steel with the chemical resistance of "Penton," a chlorinated polyether resin developed by Hercules Power Co. "Penton" provides excellent corrosion resistance to most acids, alkalis and solvents at temperatures up to 250 F, depending upon the particular chemical element or compound. Some possible applications are for chemical processing, electroplating, steam and hot water lines, paints, oils, paper mills, power plants, steel mills, etc.

Electric Cord Reel

E–19 **Cordomatic**, 17th and Indiana Ave., Philadelphia 32, Pa., is offering the new Model 800 Droplight Reel to eliminate dangerously kinked and knotted



electric cords. When not in use, the cord automatically retracts into its reel housing.

The reel locking mechanism operates on a gravity stop principle, which locks and releases with fingertip control at any length up to 30 ft. The heavy-duty spring motor is dustproof and lifetime lubricated. The complete unit is UL approved.

Latex Flooring Compound

E–20 The Corrosion Engineering Products Dept., **Pennsalt Chemicals Coporation**, Natrona, Pa., has introduced "Penntrowel" latex, a two-component mortar for a variety of industrial flooring applications.

The components can be combined in conventional mortar boxes or concrete mixers to form a tough, resilient topping. The binder is a liquid latex dispersion packaged in five-gallon steel drums. The filler is a dry cement-aggregate premix, packaged in 70 lb net moisture-proof bags. Five bags of filler mixed with one drum of binder forms a mortar which can be screened and troweled to required thickness in one application.

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New Product Briefs (Continued)

Duo-Speed Drill

E–21 **Cummins Portable Tool Division** of the John Oster Manufacturing Co., Milwaukee 17, Wis., has combined two portable power drills in one unit, with both ¼" and ⅜" speeds.

This new Duo-Drill automatically adjusts drilling speed when in use. Loaded speed in metal for ¼" bit is 1500 rpm, and for ⅜" bit is 1050 rpm. It will drill up to 1" diameter in wood and ⅜" in metal, and is powerful enough for stone, tile or concrete drill jobs. Duo-Drill Model 328-01 is priced at $25.95.

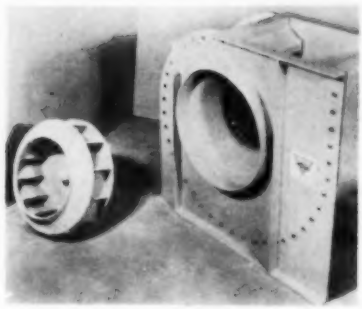
Green Aluminum Paint

E–22 The lasting performance of aluminum, plus the rich beauty of tinted green to beautify and protect metal, wood and masonry surfaces is provided in the new 1030 Green Aluminum, recently announced by **Rust-Oleum Corporation,** 2799 Oakton Street, Evanston, Ill.

It is specially formulated to produce a tough, durable, attractive finish for widespread use by industries and municipalities. It incorporates the same high quality ingredients as other Rust-Oleum exclusive formulations to resist moisture, sun, fumes and weathering.

Plastic Blowers

E–23 **The Ceilcote Company,** 4832 Ridge Rd., Cleveland 9, Ohio, has announced a new line of Duracor reinforced plastic centrifugal blower housings with Duracor-covered standard fan wheels. Offering extreme chemical resistance plus high strength/weight



ratios, the units can be installed as separate components in existing systems or integrally designed into entire Duracor exhaust systems. Both housings and ducts are corrosion-proof throughout to provide maximum resistance to attack from practically any acid, alkali or fume.

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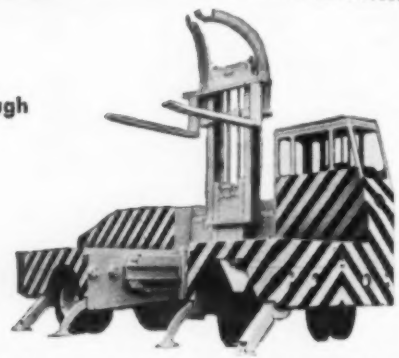

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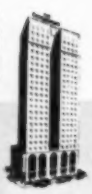

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Fabric Backed Urethane

E–24 A fabric backed urethane specially designed to be used as a liner for handling grain, ore slurries, coal, coke, rock, sand and gravel, glass and other

abrasive materials has been developed by the **Armstrong Cork Company**, Industrial Division, Lancaster, Pa.

Called Armstrong PO-663, the new material provides maximum abrasion resistance, reduces cost by protecting expensive chutes and equipment, has longer life, allows use of thinner gauge materials, reduces maintenance, and can be easily installed by cementing or bolting.

The two sections of grain loading chutes illustrated were used the same length of time. The unlined steel chute on right was worn clear through while the section lined with fabric backed urethane shows only a slight amount of surface abrasion.

Blacktop Sealer

E–25 A new siliconized blacktop sealer, especially adapted for fast, efficient and low cost application with roller, is announced by **Pace Products, Inc.**, 1609 Washington St., Kansas City 8, Mo.

Called "Park-King," this sealer is rolled on the blacktop to produce a one-coat, satin black finish which completely seals all hairline cracks, pits and voids; is waterproof and resistant to gasoline, oil, oxidation and normal deterioration caused by weathering.

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See Pages 85 & 86

Vibro-Graver

Burgess Vibrocrafters, Inc., E–26 Commercial Products Division, Grayslake, Ill., has introduced a new deluxe electric "Vibro-Graver" with carbide point which writes at a speed of 7,200 vibrations a minute.

The portable instrument is encased in unbreakable polypropylene with a comfortable hand-rest design. A control wheel is adjustable to fine, medium, or coarse stroke on metals, marble, tile, glass, plastics, leather, ceramics, and hard rubber.

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Benjamin Foster Co., 4635 W. Girard Ave., Philadelphia 31, Pa.

Biddle Co., James G., 1316 Arch St., Philadelphia, Pa.

Boiler Tube Company of America, McKees Rocks, Pa.

The Bunting Brass & Bronze Co., 715 Spencer, Toledo 1, Ohio

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Truscon Laboratories, 2800 E. Ponce de Leon Ave., Decatur, Ga.

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Universal Metal Hose Co., 2149 Kedzie Ave., Chicago 23, Ill.

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Subox Inc., 6 Fairmount Plant, Hackensack, N. J.

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Union Steel Corp., 2146 Stanley, Union, N. J.

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Westinghouse Electric Corp., Box 2278, Pittsburgh 30, Pa.

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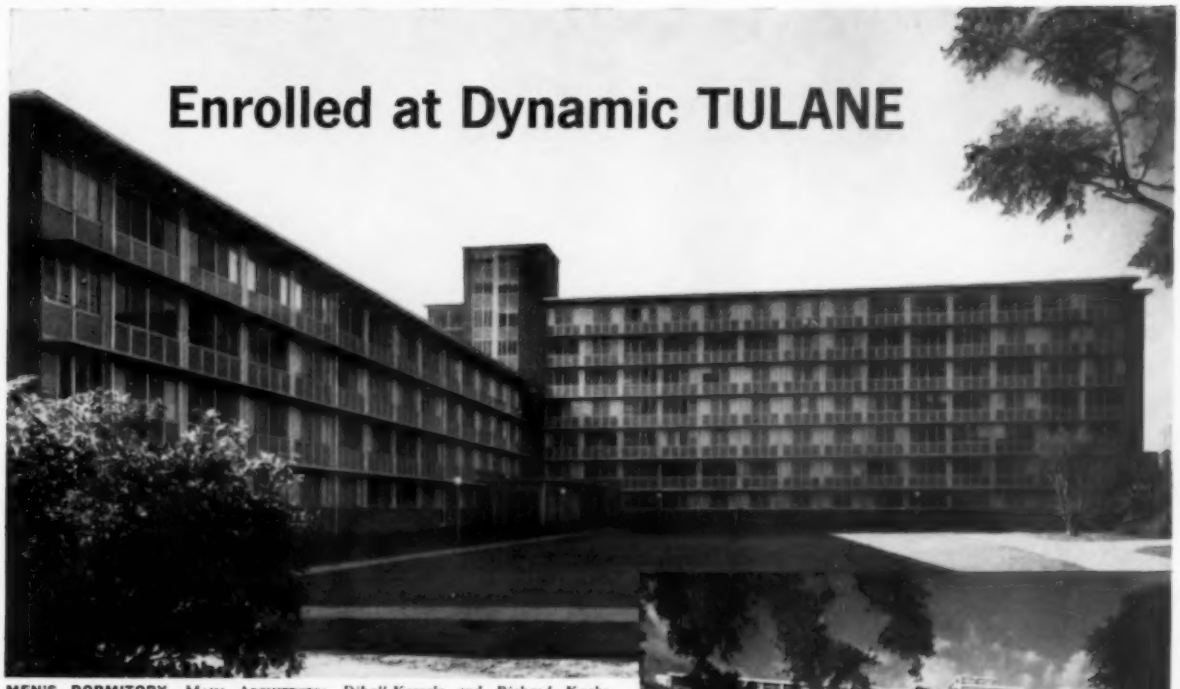

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"Dynamic" is the word for tradition-laden, prestige-rich, 127-year-old Tulane University in New Orleans.

Nowhere is Tulane's dynamism more remarkable and articulate than in its current building program.* Examples: the three brand new, beautiful and beautifully functional structures pictured here.

If you toured these buildings and the power plant which serves the campus complex, again and again and again you'd see the distinctive Diamond-mark that identifies Jenkins Valves. And small wonder: a university which had its beginnings more than a century ago just naturally thinks in terms of long-range dependability, long-time maintenance economy . . . precisely the qualities which make Jenkins Valves the "Standard of Quality" by which other valves are measured! Yet — and this fact still comes as a pleasant surprise to some specifiers — *they cost no more!* Jenkins Bros., 100 Park Ave., New York 17.

*Tulane's supervisory and liaison personnel for the building program: Harold E. Pique, Director of Planning; George F. Johnson, Director of Physical Plant; Charles E. Gilbert, Utilities Superintendent.

APARTMENT BUILDING *for married students.* MAIN ARCHITECTS: *Goldstein, Parham & Labouisse.* GENERAL CONTRACTOR: *J. A. Jones Construction Co.* MECHANICAL CONTRACTOR: *Sciambra & Masino.* PLUMBING CONTRACTOR: *Jas. F. O'Neil Co., Inc.* CONSULTING ENGINEERS: *Design Engineers & Associates.*

UNIVERSITY CENTER *features swimming pool, bowling lanes, radio station, cafeteria, ballroom.* MAIN ARCHITECTS: *Curtis & Davis and Associates; Edward Silverstein.* GENERAL CONTRACTOR: *Farnsworth & Chambers.* MECHANICAL CONTRACTOR: *Sciambra & Masino.* CONSULTING ENGINEERS: *Leo S. Weil; Walter B. Moses.*

POWER PLANT. *Boiler feed water pumps and Jenkins Valves shown.* MAIN ARCHITECTS: *Paul Charbonnet, Jr.* GENERAL CONTRACTOR: *Gervais Favrot Co.* MECHANICAL & PLUMBING CONTRACTOR: *Comfortaire Co., Inc.* CONSULTING ENGINEERS: *Leo S. Weil; Walter B. Moses.*

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